

RELIABLE

VACUUM & VACU-VAPOR HEATING EQUIPMENT



Manufactured by
The Bishop Babcock-Becker Co.

W. D. CASHIN

130 High Street

Boston, Mass.



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Manufactured by

THE BISHOP - BABCOCK - BECKER CO.

Cleveland - 49th St. and Hamilton Ave.
New York City - 431-441 Lafayette St.
Milwaukee - - - - - 229 Cedar St.
St. Louis - - - - - 210-212 S. Broadway

Chicago - 219-225 W. Washington St.
Cincinnati - - - - 1025 Central Ave.
St. Paul - - - - - 338-40 Minnesota St.
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Foreword

YOU will find in this catalog a thorough description of the RELIABLE Air Line and Return Line Vacuum and Vacu-Vapor Heating Equipment. Each part is illustrated and described separately; and the installation and operation of the equipment is also clearly explained.

We want to emphasize the fact that all RELIABLE Equipment is manufactured, and properly tested and adjusted at our factory. For this reason we can and do guarantee the RELIABLE Equipment to operate satisfactorily. If equipment is installed the parts of which are made by several Companies none of them can be responsible.

This guarantee puts the responsibility directly up to us.

GUARANTEE

***W**E guarantee the RELIABLE Heating Equipment furnished by us to be correct in mechanical principles and construction.*

We guarantee that all parts have been properly tested and adjusted, and are free from original defects in material and of first-class workmanship.

We agree, free of charge, to replace or repair any parts proven defective—ordinary wear and tear, abuse and neglect excepted—upon delivery to our factory for inspection.

THE BISHOP-BABCOCK-BECKER CO.

RELIABLE HEATING EQUIPMENT

RELIABLE Electric and Hydraulic Vacuum Pumps with accessories comprise complete automatic working outfits. They are tested as a unit and properly adjusted at our factory, so when **RELIABLE** Heating Equipment arrives on a job it is ready to be installed. No time is wasted in making adjustments when installing, and the installation is accomplished quickly, at unusually low cost.

All **RELIABLE** Valves are permanently adjusted, and no adjustments are required when installing, or afterward. This does away with the necessity of making frequent experiments and changes to get the proper adjustment when installing, as is the case with the majority of other valves; nor is it necessary to change the adjustment every month or so after installation.

From the illustrations and description it will be seen that **RELIABLE** Heating Equipment is very simple in design, having no complicated attachments to get out of order. All parts of our equipment are made from materials that we have found are best suited for the purpose and will last longest—the **RELIABLE** Equipment will give the same good service year after year.

The fact that **RELIABLE** Heating Equipment is used in many of the most prominent buildings throughout the United States surely demonstrates that it provides most efficient and economical heating service. We will be pleased to send you a list of the installations in your vicinity.

Complete suggestions for specifications covering the **RELIABLE** Air Line and Return Line Vacuum and Vacu-Vapor Heating Equipment are given on the last pages of this catalog.

RELIABLE HEATING EQUIPMENT

WHAT VACUUM HEATING IS

The term "Vacuum Heating" is oftentimes misunderstood, as it naturally conveys the impression that vacuum is used as a heating medium. This, however, is not the case and we will explain just what it means, why it is used, its advantages, etc.

Vacuum heating equipment is used in connection with steam heating plants to overcome certain deficiencies—in other words to make steam plants fully efficient, and to save fuel.

Steam is generally conceded to be the most satisfactory and economical heating medium, but the great difficulty with steam heating plants is that they are always more or less air bound. We mean by this that air accumulates in the radiators, piping and boiler, and naturally prevents the steam circulating freely and thoroughly. In the ordinary steam plant the only way to get rid of the air is to force it out with steam pressure, through vent valves on radiators. As the openings in these valves are very small, this operation often takes two or three hours every morning, during which time the occupants have to suffer from the cold. Of course a great deal of fuel is burned to produce the steam pressure which is required to force air out of the system, and to keep it out.

It was finally discovered that vacuum in a steam heating plant would eliminate air resistance, by drawing air from the radiators, piping and boiler; and that after exhausting the air it would pull steam into the radiators, in the same manner that a vacuum cleaner sucks in dirt. The result is quick, thorough and even heating, as steam reaches all radiators instantly and each one is entirely filled with steam—fully efficient. It was also found that with two pipe gravity return plants the vacuum would pull out the water of condensation, thereby insuring thorough draining, which prevents hammering in the pipes and freezing. It was further discovered that the vacuum in the boiler exerts a suction on the water, which enables it to boil at less than

RELIABLE HEATING EQUIPMENT

212° Fahrenheit. This means that steam is produced and transmitted to the radiators at a lower temperature than is possible with an ordinary steam heating plant. The result is a big saving in fuel.

We have given a concise description of the functions of vacuum in steam heating plants, and in this catalog clearly explain how it is created, maintained and effectually controlled by the three different kinds of RELIABLE Heating Equipment, Air Line and Return Line Vacuum and Vacu-Vapor. The RELIABLE Equipment covers every requirement, and is just as efficient in a big sky-scraper as in a small residence.

AIR LINE EQUIPMENT

The RELIABLE Air Line Vacuum Heating Equipment is used with one pipe low pressure steam heating plants, of any size. The vacuum is created and maintained by a RELIABLE Electric or Hydraulic Vacuum Pump, and our Equipment comprises a complete automatic working outfit.

RETURN LINE EQUIPMENT

The RELIABLE Return Line Vacuum Heating Equipment is used with two pipe low pressure steam heating plants, of any size. The vacuum is created and maintained by a RELIABLE Electric Vacuum Pump, and our Equipment comprises a complete automatic working outfit.

VACU-VAPOR EQUIPMENT

The RELIABLE Vacu-Vapor Heating Equipment may be used with two pipe low pressure steam heating plants, of any size. The vacuum which is automatically created through steam condensing in radiators is utilized by our Vacu-Vapor Equipment. For this reason it is invaluable where electricity is not available, or where there are objections to use of a vacuum pump.

The "*reasons why*" RELIABLE Heating Equipment perfects low pressure steam plants, and still reduces fuel bills considerably are clearly explained in this catalog.

RELIABLE AIR LINE VACUUM
HEATING EQUIPMENT

The RELIABLE Air Line Vacuum Heating Equipment is used in connection with a low pressure steam heating plant, to provide quick, thorough and even heat circulation, with a great fuel saving. Its use eliminates hissing radiators, leaky vent valves, hammering, and prevents loss or escape of steam—all the steam is utilized for heating.

The RELIABLE Air Line Equipment, by means of an Electric or Hydraulic Vacuum Pump, creates and maintains a partial vacuum in a heating system, which quickly draws out the air and pulls steam into all radiators. *This means rapid heating throughout the entire system.*

The VacUstats (one is placed on each radiator) allow air to be drawn from the system, but when steam reaches them they close automatically, *so steam cannot escape.* When steam condenses in radiators, the VacUstats open automatically and permit the vacuum to pull more steam into them. Every radiator becomes fully efficient, *which results in thorough and even heating.*

The vacuum extends to the boiler and *enables steam to generate at less than 212 degrees Fahrenheit,* which is an impossibility with the ordinary steam plant. No fuel is burned (wasted) to produce steam pressure for driving air out of the system before steam can enter and circulate properly, as is the case with the average plant. With our equipment ample heat is usually secured with vacuum instead of pressure in the boiler. In many cases (in climates where the temperature drops to zero) it has been unnecessary to create steam pressure all winter. These are reasons why *the RELIABLE Equipment reduces fuel bills considerably.*

VACUUM HEATING EQUIPMENT

With our Air Line Equipment, air vent valves are not required on the radiators. This means that hissing, sputtering radiators are eliminated, and there can be no leakages to spoil the furnishings: and furthermore air in the rooms is not fouled by odors from the boiler, piping and radiation.

The RELIABLE Air Line Equipment is automatic and noiseless; a detailed description of its operation is given on pages 24 and 25. All our equipment is very simple, having no complicated parts to cause trouble by getting out of order. It is thoroughly tested and properly adjusted, before being shipped from our factory. See our guarantee on page 2.

The Air Line Vacuum Heating Equipment is installed at low cost; the operating expense is very low.

WHAT THE EQUIPMENT CONSISTS OF

The RELIABLE Air Line Equipment consists of an Electric or Hydraulic Vacuum Pump with accessories as listed on page 11, one VacUstat for each radiator or coil, and a Compound Gauge for the boiler. See description of VacUstat on pages 18 and 19.

The Electric Vacuum Pumps can be used in any style or size building. They are illustrated and described in detail on pages 12 to 17 inclusive.

The Hydraulic Vacuum Pumps are especially valuable where electricity is not available, and are suitable for residences or other buildings having up to 20,000 square feet of direct radiation. See pages 22 and 23.

The functions of RELIABLE Equipment, how it is installed, etc., is clearly explained on pages 24 and 25.

ADAPTABILITY

The RELIABLE Air Line Vacuum Heating Equipment is used with new or old one pipe low pressure steam heating plants of any size, and is just as efficient in the biggest sky-scraper as in a small residence. It can also be applied to old two pipe steam plants. See page 10 for using the RELIABLE Equipment with steam plants already installed.

The RELIABLE Air Line Equipment works equally well with plants fed by steam from a low pressure boiler; steam from a central station; exhaust steam; or steam from a high pressure boiler, if reduced and regulated not to exceed 15 pounds pressure.

When our equipment is used with a plant fed by exhaust steam, the vacuum pump keeps the system free from air and pulls steam into all the radiators. This naturally reduces back pressure on the steam engines or pumps, thereby increasing their efficiency and saving considerable fuel. As the engines or pumps seldom operate all of the time, it is usually necessary to bypass live steam into an exhaust steam system, so that a constant supply of steam is available.

Where steam from a central station is used, the pressure is often very low at the ends of mains and laterals, and in such cases the steam will not enter and circulate in the ordinary heating system. RELIABLE Air Line Equipment positively overcomes this trouble, as the vacuum pump eliminates air resistance and pulls the steam into every radiator.

RELIABLE Air Line Equipment is used in many of the most prominent buildings throughout the United States. Send for list of the installations in your vicinity.

LOW COST OF INSTALLATION

RELIABLE Air Line Vacuum Heating Equipment is manufactured *complete* at our factory. We thoroughly test our equipment, and the adjustments are *properly* made. Therefore, when RELIABLE Vacuum Heating Equipment arrives at a building, it is ready to be installed—*no bother or delays are occasioned in making adjustments when installing.*

There is nothing complicated about the Air Line Equipment, and the installation is accomplished *quickly* at *low cost*.

When RELIABLE Air Line Equipment is used in connection with a steam heating plant already installed, practically all the old equipment is utilized. See page 10 for further particulars.

LOW UPKEEP OR OPERATING EXPENSE

As RELIABLE Electric or Hydraulic Vacuum Pumps have large capacity, air is rapidly drawn out of a heating system, and the proper degree of vacuum quickly created. The vacuum held in the expansion tank and return piping assists the pump to keep system free from air, *insuring less frequent pump operation.* With a tight system a RELIABLE Vacuum Pump has occasion to operate but seldom, which explains why the operating expense is very low.

The Vacuum Controller which operates the Automatic Electric Switch is *positive-acting*—the vacuum pump can start and operate only when necessary.

THE RELIABLE AIR LINE

A STEAM HEATING PLANT ALREADY INSTALLED IS MADE FULLY EFFICIENT BY THE RELIABLE EQUIPMENT

RELIABLE Air Line Equipment can readily be applied to one pipe low pressure steam heating plants already installed; also to two pipe gravity return plants, and in many cases all the old equipment is utilized.

The following equipment and changes are required:

The RELIABLE Equipment consists of either an Electric or Hydraulic Vacuum Pump, of sufficient capacity, with equipment as listed on page 11, one VacUstat for each radiator or coil, and a Compound Gauge for the boiler. See detailed layouts on pages 24, 25, 30 and 31, which show proper methods of installing.

If a One Pipe Steam Plant, the supply piping does not have to be disturbed, if of ample capacity and if properly installed. Air piping must be installed so that each radiator and coil is connected to the vacuum pump and equipment. (See table of air pipe sizes on page 78). If the plant is equipped with drip or air lines, they can be used in place of new piping, thereby saving the cost of air piping. The radiators and coils are utilized; also the supply valves. The boiler is always used, unless the capacity is insufficient. The system should be made tight and thoroughly cleaned before it is operated.

If a Two Pipe Gravity Return Steam Plant, the supply and return piping does not have to be disturbed, if of ample size and if properly installed. Air piping must be installed so that each radiator and coil is connected with the vacuum pump and equipment. (See table of air pipe sizes on page 78). The radiators and coils are utilized; also the supply valves. The boiler is always used, unless the capacity is insufficient. The system should be made tight and thoroughly cleaned, before it is operated.

Note:—We will be pleased to give further particulars upon request.

VACUUM HEATING EQUIPMENT

RELIABLE ELECTRIC AIR LINE OUTFITS

Nos. 1279, 111, 112, 113, 114 and 115

These outfits comprise a complete automatic working unit and consist of the following:

Vacuum Pump including Base, Check Valves, Belt, Special Automatic Belt Tightener and Grease Cups.

Electric Motor (direct or alternating current.)

(Specify voltage if direct current motor is required, and voltage and cycle if alternating current. We furnish single phase alternating current motors *only*, as they operate on 2 or 3-phase circuits, whereas 2 or 3-phase motors will not run on single phase current.)

Automatic Electric Switch and Vacuum Controller No. 1859.

Strainer, (No. 2249 with Outfits No. 1279, 111 and 112, No. 2259 with No. 113 Outfit, No. 2269 with Outfit No. 114, and No. 2279 with the No. 115 Outfit.)

Expansion Tank.

Vacuum Gauge.

Flanged Screw Connections.

Note—The No. 111 Pump is gear driven.

RELIABLE HYDRAULIC AIR LINE OUTFITS

Nos. 101, 102, 104 and 106

These outfits comprise a complete automatic working unit and consist of the following:

Hydraulic Vacuum Pump.

Automatic Cut-off and Vacuum Controller No. 1919.

Air Separator with strainer, (No. 1979 with No. 101 Outfit and No. 1969 with Outfits Nos. 102, 104 and 106.)

City Water Pressure Regulator, (No. 357 with No. 101, 102 and 104 Outfits, and No. 367 with Outfit No. 106.)

City Water Strainer No. 2239.

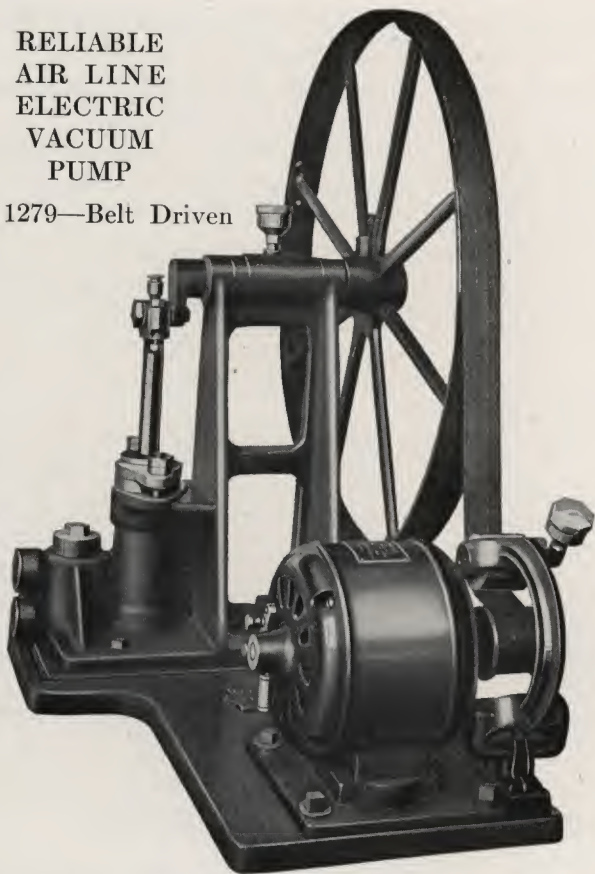
Vacuum Gauge.

Necessary Couplings.

THE RELIABLE AIR LINE

RELIABLE AIR LINE ELECTRIC VACUUM PUMP

No. 1279—Belt Driven



See page 11 for list of equipment included with this pump.

The No. 1279 RELIABLE Electric Vacuum Pump is automatic and noiseless, and works so perfectly that it requires less power than any other vacuum pump. The cost for current is only $\frac{1}{3}$ to $\frac{1}{5}$ that of other makes.

The No. 1279 Pump is simple in design and durably constructed—there are no complicated, unnecessary parts to get out of order.

See detailed description on next page

VACUUM HEATING EQUIPMENT

DETAILED DESCRIPTION OF No. 1279 RELIABLE AIR LINE ELECTRIC VACUUM PUMP

Capacity. This pump will handle heating systems having up to 4000 square feet of direct radiation.

Electric Motor, either direct or alternating current, is of standard make— $\frac{1}{6}$ horse power. It starts easily under full load, and will operate on a voltage variation of 10 per cent. We furnish single phase alternating current motors *only*, as they operate on 2 or 3-phase circuits, whereas 2 or 3-phase motors will not run on single phase current.

Low Cost for Current. With a tight system the No. 1279 Pump has occasion to operate but seldom, and as the motor is only $\frac{1}{6}$ horse power, the cost for electric current is exceptionally low.

Special Automatic Belt Tightener always keeps the belt tight, and prevents it slipping—there is no lost motion, or binding. Friction and wear are reduced to a minimum.

Cylinder is of the vertical single-acting type, cast in one piece with the stand.

Piston. The heavy bronze piston is of the simple plunger type. The connecting rod is iron, with bronze bushings. The main shaft bearings are phosphor bronze.

Valves. The two valves are held in place by a phosphor bronze spring, which insures easy operation and positive seating. The valves are easily accessible. The valves are composition, and are very durable, either side may be used. The valve seat is removable, and is made of bronze.

Base is heavy iron, cast in one piece. It has a gutter around the edge to catch any drip.

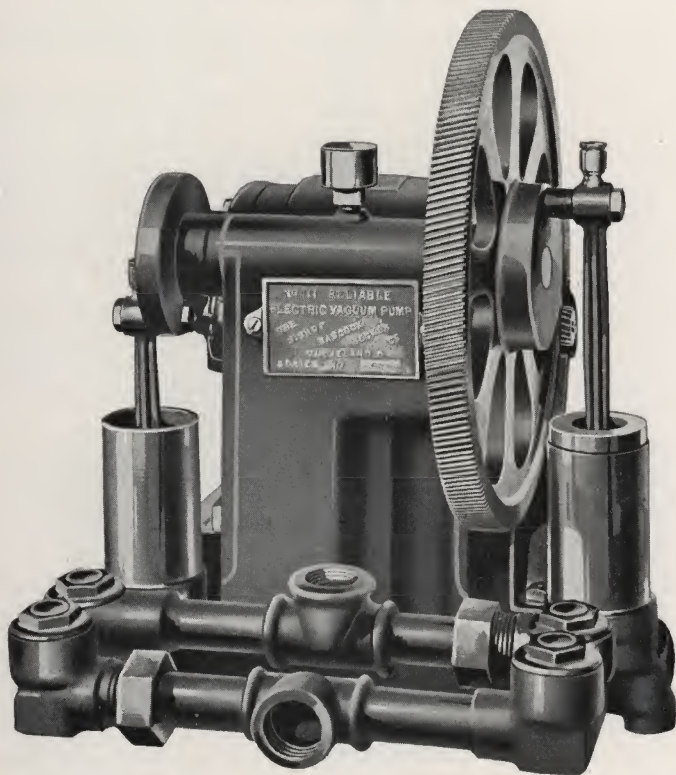
Lubrication. The bearings have large grease cups, which require only occasional filling.

*See page 77 for specifications and dimensions
of the No. 1279 Electric Pump*

THE RELIABLE AIR LINE

RELIABLE AIR LINE ELECTRIC VACUUM PUMP

No. 111—Gear Driven



See page 11 for list of equipment included with this pump.

The No. 111 RELIABLE Electric Vacuum Pump is automatic and noiseless, and draws air continuously when in operation. It is operated to its full efficiency by a $\frac{1}{6}$ horse power motor. The cost for current is very low.

The No. 111 Pump has no complicated, unnecessary parts to get out of order, and is built to give many years of satisfactory service.

See detailed description on next page

VACUUM HEATING EQUIPMENT

DETAILED DESCRIPTION OF No. 111 RELIABLE AIR LINE ELECTRIC VACUUM PUMP

Cylinders. This pump has two vertical, single-acting cylinders, which always draw air steadily when in operation. The cylinders are heavy seamless brass tubing.

Capacity. This pump will handle heating systems having up to 5000 square feet of direct radiation.

Electric Motor, either direct or alternating current, is of standard make— $\frac{1}{6}$ horse power. It starts easily under full load, and will operate on a voltage variation of 10 per cent. We furnish single phase alternating current motors *only*, as they operate on 2 or 3-phase circuits, whereas 2 or 3-phase motors will not run on single phase current.

Low Cost for Current. With a tight system the No. 111 Pump has occasion to operate but seldom, and as the motor is only $\frac{1}{6}$ horse power, the cost for electric current is exceptionally low.

Gears. The large gear acts as a combined fly wheel and gear; insures steady operation; and prevents wear and strain on motor. The motor gear is made of rawhide, which is more durable than brass or steel. The gears have spiral teeth—3 teeth in each gear are always in contact, assuring *smooth* operation.

Pistons are grey iron, packed with three rings of packing, and have compensating springs, which automatically take up wear in the packing.

Valves are readily accessible. The removable valve seats are bronze. The main shaft bearings and pinions are phosphor bronze.

Base is heavy iron, cast in one piece.

Lubrication. All bearings have large grease cups, which require only occasional filling.

*See page 77 for specifications and dimensions of
this Electric Pump*

RELIABLE AIR LINE
ELECTRIC VACUUM PUMPS

Nos. 112, 113, 114 and 115



See page 11 for list of equipment included with these pumps

NOTE THE SIMPLICITY

The RELIABLE Electric Vacuum Pumps are automatic and noiseless, and draw air continuously when in operation. With their double speed reduction, they work slowly and evenly, and use but $\frac{1}{3}$ to $\frac{1}{5}$ the power required to operate other vacuum pumps. The cost for current is lower in proportion.

See next page for complete description

VACUUM HEATING EQUIPMENT

DESCRIPTION OF RELIABLE AIR LINE ELECTRIC VACUUM PUMPS Nos. 112, 113, 114 and 115

The RELIABLE Pumps are simple in design and durably constructed, and can always be depended on to operate satisfactorily, year in and year out.

Following is a detailed description:

Cylinders. These pumps have two vertical, single-acting cylinders, which always draw air steadily when in operation. The cylinders are heavy iron.

Large Capacity. The Pumps have unusually large capacity. See page 77 for number square feet radiation each pump is capable of handling.

Electric Motors are furnished, either direct or alternating current, of standard make. They start easily under full load, and will operate on a 10 per cent variation in voltage. We furnish single phase alternating current motors *only* as they operate on 2 or 3-phase circuits, whereas 2 or 3-phase motors will not run on single phase current. The motors required to operate our pumps are much smaller than those of other vacuum pumps. The cost for electric current is very low.

Special Automatic Belt Tightener always keeps belt tight, and prevents it slipping—there is no lost motion, or binding. Friction and wear are reduced to a minimum.

Pistons are of the simple plunger type, and are heavy iron. The connecting rods are iron, with bronze bushings.

Valves always operate and seat perfectly; are noiseless; and are readily accessible. They are made of a special composition, which is exceptionally durable. The bronze valve seats are removable.

Bearings. The main shaft bearings and pinions are solid bronze.

Base is heavy iron, cast in one piece. It has a gutter around the edge in form of a drip pan, which keeps oil off floor.

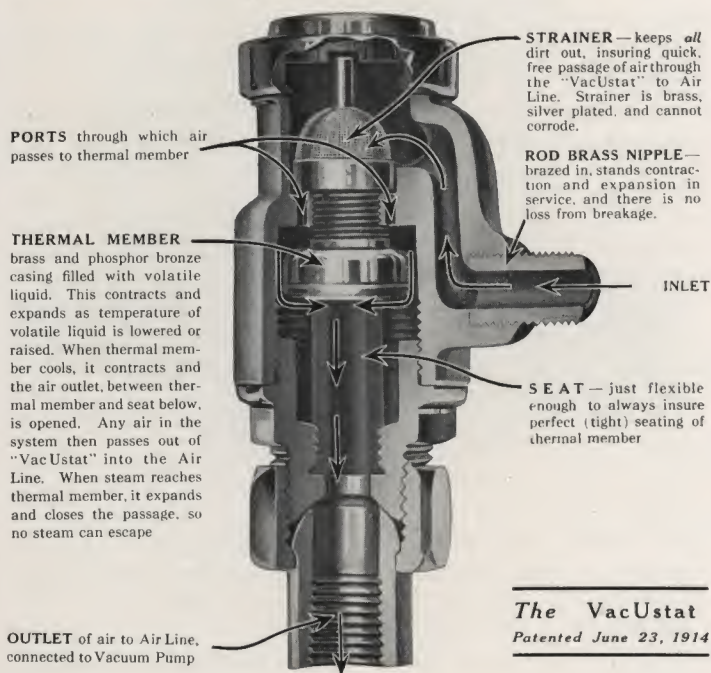
Lubrication. All bearings have large grease cups, which require only occasional filling.

*See page 77 for specifications and dimensions of
these Vacuum Pumps*

THE VACUSTAT WHAT IT IS—HOW IT OPERATES

The VacUstat is a thermostatic valve which automatically keeps the radiators, pipes and boiler free from air, and prevents escape of steam.

The VacUstat is entirely different and far superior to any other radiator air valve. The chart below clearly explains the construction and operation.



The VacUstat
Patented June 23, 1914

Capacity — 150 Square Feet Direct Radiation

A VacUstat is placed on each radiator or coil at highest vent tapping, and through its use air resistance is eliminated from the system. Every radiator becomes fully efficient, which means *thorough and even heat circulation*. Having three to four times the venting capacity of the ordi-

VACUUM HEATING EQUIPMENT

nary air valve, the VacUstat enables the pump to rapidly draw air from the radiators, supply piping and boiler. *Heat reaches the radiators instantly*, so quick heating is assured at all times.

The VacUstat is very durably constructed, and will last longer than other air valves. The body and cap are heavy brass. The case of the thermal member is rod brass; the diaphragm is phosphor bronze. The seat is made of a durable composition. The strainer is brass, silver plated. The rod brass nipple is brazed into the body.

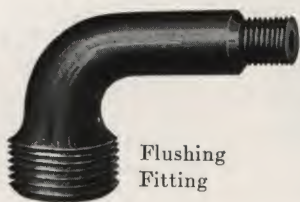
Each VacUstat is thoroughly tested and properly and permanently adjusted, at our factory. No adjustments are necessary when installing, or afterward. The VacUstat is made in one size only, and is heavily nickel plated. (See page 79 for specifications of the VacUstat.)

Note:—The VacUstat is furnished with either $\frac{1}{8}$ or $\frac{1}{4}$ inch radiator connections. The pipe connection is $\frac{1}{4}$ inch.

See our guarantee on page 2



FLUSHING FITTING



Flushing
Fitting

A flushing fitting is furnished with each VacUstat, for use when cleaning the heating system. This fitting has the same size connections as the VacUstat, and readily interchanges with it, without disturbing the piping.

AUTOMATIC ELECTRIC SWITCH AND VACUUM CONTROLLER No. 1859

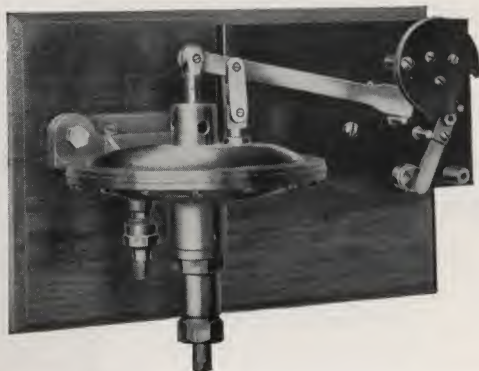
The Automatic Electric Switch and Vacuum Controller is used with RELIABLE Electric Vacuum Pumps, to insure their automatic operation and to maintain the desired vacuum in a heating system. When the proper degree of vacuum is created, the Automatic Electric Switch, by means of the Vacuum Controller, automatically stops the pump. When the vacuum is lowered 2 inches, the pump is automatically started.

The action of the Vacuum Controller is *positive*, and the proper degree of vacuum is *always* maintained. It is easily adjusted for any range of vacuum. The Automatic Electric Switch has only one knife blade, and a *perfect* connection is assured.

The Automatic Electric Switch is very substantially made, and is mounted on a neat slate panel. The Vacuum Controller is constructed of heavy bronze, and is mounted with the Automatic Electric Switch on a wood panel.

The Automatic Electric Switch and Vacuum Controller No. 1859 is very simple; has no parts to get out of order; and enables RELIABLE Electric

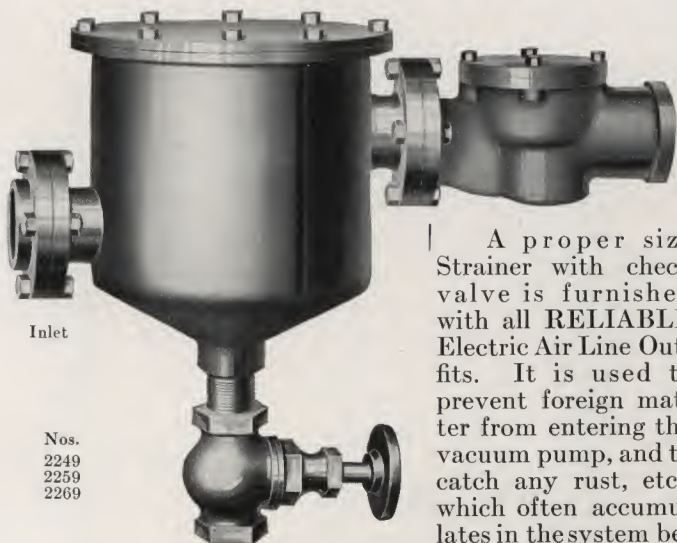
Vacuum
Pumps to be
operated very
economically.



The Automatic Electric Switch and Vacuum Controller is included with all RELIABLE Air Line Electric Outfits.

VACUUM HEATING EQUIPMENT

STRAINER WITH CHECK VALVE



Inlet

Nos.
2249
2259
2269

A proper size Strainer with check valve is furnished with all **RELIABLE** Electric Air Line Outfits. It is used to prevent foreign matter from entering the vacuum pump, and to catch any rust, etc., which often accumulates in the system between heating seasons.

The check valve automatically prevents air getting back into system through pump. The globe valve at the bottom of Strainer is furnished.

The Strainer is very durable. The body is made of heavy cast iron; the strainer inside is heavy brass, reinforced by a perforated bronze plate.

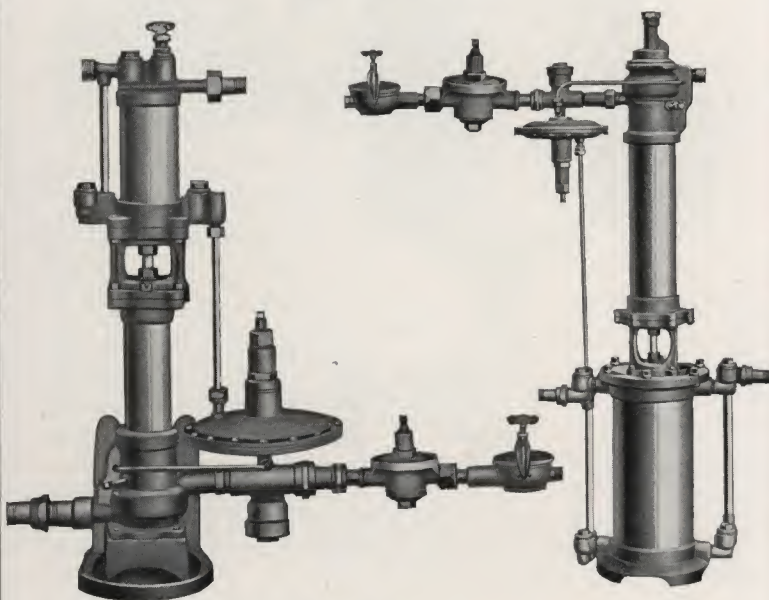
Note:—No. 2249 Strainer is furnished with Outfits No. 1279, 111 and 112, No. 2259 with No. 113 Outfit, No. 2269 with Outfit No. 114 and No. 2279 (shown on page 45) with No. 115 Outfit.

EXPANSION TANK

An Expansion Tank of proper size is always furnished with **RELIABLE** Electric Outfits to hold a steady vacuum in a heating system. The vacuum created in the Expansion Tank is often sufficient to keep a system free from air for some time, without operation of the electric vacuum pump. *This insures additional economy.*

As the Automatic Electric Switch and Vacuum Controller is connected to the Expansion Tank, a steady vacuum is always on the Vacuum Controller, which assures perfect operation of the Automatic Electric Switch. *The Vacuum Pump can operate only when necessary.*

RELIABLE AIR LINE HYDRAULIC
VACUUM PUMPS



Nos. 101, 102 and 104

No. 106

See page 11 for list of equipment included with these pumps

The RELIABLE Hydraulic Vacuum Pumps are entirely automatic and absolutely noiseless in operation, and always work properly. The mechanism is the most simple and positive ever invented, and there are no complicated parts to get out of order. These pumps are durably constructed, and will give many years of satisfactory service.

See complete description on next page

VACUUM HEATING EQUIPMENT

DETAILED DESCRIPTION OF THE RELIABLE AIR LINE HYDRAULIC VACUUM PUMPS

Large Capacity. The pumps have large air displacing capacity. See page 77 for number square feet radiation each pump will handle.

Low Cost for Water. With a tight system the pump has occasion to operate but seldom, and as it uses water only when drawing air, the cost for city water is very low.

Cylinders. These pumps have two vertical cylinders, one for motive power and the other draws the air. The air cylinder is double-acting, and draws air steadily when pump is in operation. The Nos. 101, 102 and 104 Pumps have the motive cylinder at the bottom, and the No. 106 Pump has the motive cylinder at the top. One piston rod is used for both cylinders, so the strokes are always uniform, and full length. There is no lost motion, and friction and wear are reduced to a minimum. Both cylinders are very durable, being heavy, seamless brass tubing.

Pistons are bronze, packed with the best leather packing. The piston rod is accurately ground tobin bronze.

Valves are easily accessible; seat perfectly; do not cause trouble; and are very durable, being a special composition. The valve seats are made of bronze.

Water Strainer. Each pump is equipped with a city water Strainer, which prevents entrance of foreign matter. This Strainer is simple, and can be cleaned quickly.

Note:—The Nos. 101, 102 and 104 Pumps are arranged for bolting to the wall. The No. 106 Pump should be placed on a brick or concrete foundation.

*See page 77 for specifications and dimensions
of these Hydraulic Pumps*

DETAILED DESCRIPTION OF OPERATION ELECTRIC VACUUM SYSTEM

Refer to detail chart. In order to show each part of our equipment plainly, we use more floor space than is necessary.

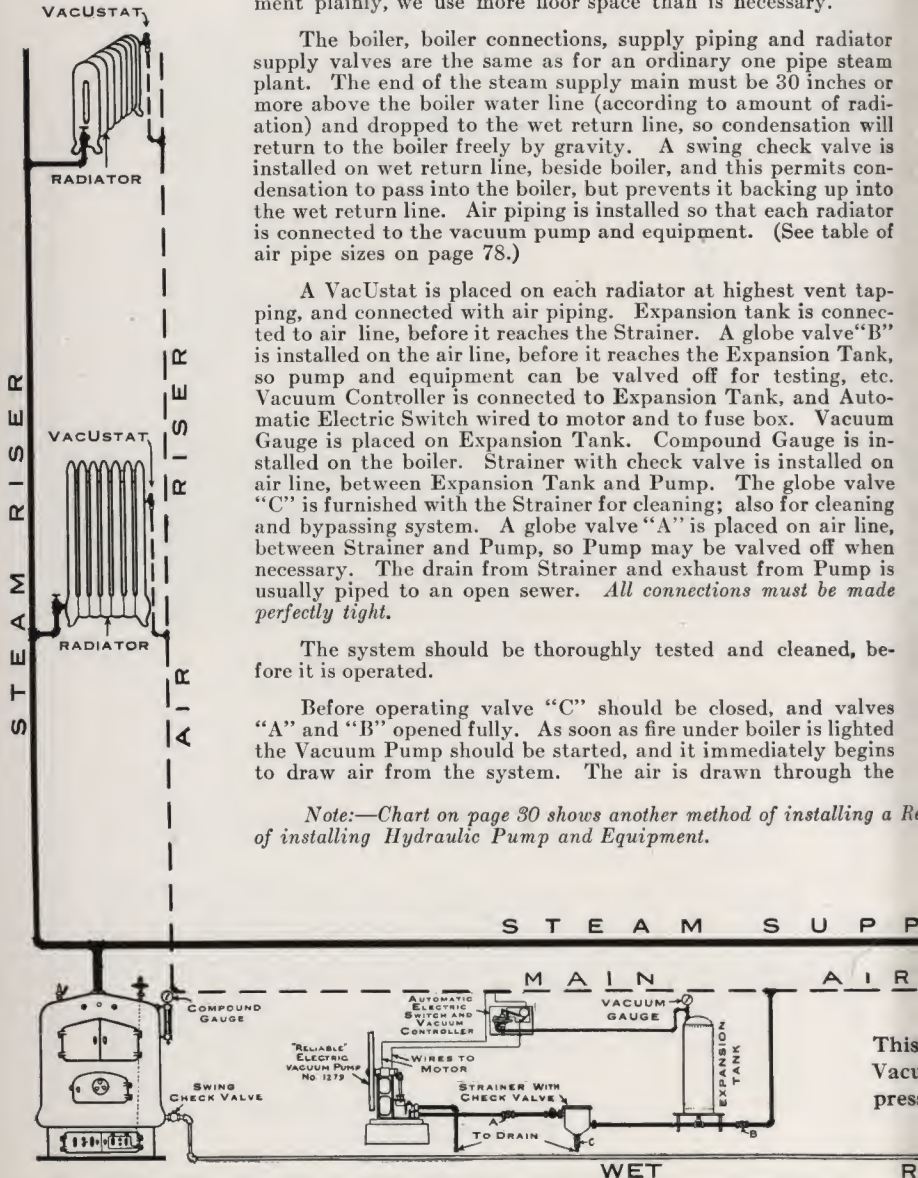
The boiler, boiler connections, supply piping and radiator supply valves are the same as for an ordinary one pipe steam plant. The end of the steam supply main must be 30 inches or more above the boiler water line (according to amount of radiation) and dropped to the wet return line, so condensation will return to the boiler freely by gravity. A swing check valve is installed on wet return line, beside boiler, and this permits condensation to pass into the boiler, but prevents it backing up into the wet return line. Air piping is installed so that each radiator is connected to the vacuum pump and equipment. (See table of air pipe sizes on page 78.)

A VacUstat is placed on each radiator at highest vent tapping, and connected with air piping. Expansion tank is connected to air line, before it reaches the Strainer. A globe valve "B" is installed on the air line, before it reaches the Expansion Tank, so pump and equipment can be valved off for testing, etc. Vacuum Controller is connected to Expansion Tank, and Automatic Electric Switch wired to motor and to fuse box. Vacuum Gauge is placed on Expansion Tank. Compound Gauge is installed on the boiler. Strainer with check valve is installed on air line, between Expansion Tank and Pump. The globe valve "C" is furnished with the Strainer for cleaning; also for cleaning and bypassing system. A globe valve "A" is placed on air line, between Strainer and Pump, so Pump may be valved off when necessary. The drain from Strainer and exhaust from Pump is usually piped to an open sewer. *All connections must be made perfectly tight.*

The system should be thoroughly tested and cleaned, before it is operated.

Before operating valve "C" should be closed, and valves "A" and "B" opened fully. As soon as fire under boiler is lighted the Vacuum Pump should be started, and it immediately begins to draw air from the system. The air is drawn through the

Note:—Chart on page 30 shows another method of installing a Relief Valve and Hydraulic Pump and Equipment.



RATION OF RELIABLE AIR LINE HEATING EQUIPMENT

Strainer, and is discharged into a sewer by the Pump. The Pump operates until the desired vacuum is created in the system; then it is stopped automatically by means of the Automatic Electric Switch and Vacuum Controller. This is usually set to stop the Pump at 7 inches of vacuum, and start it again when the vacuum drops to 5 inches. If desired, a vacuum can be maintained in the system when cold.

The vacuum in the boiler enables steam to generate at less than 212° Fahrenheit. Heat is instantly pulled into all radiators, and when steam reaches the VacUstats their thermal members expand, which closes them automatically, *preventing escape of steam*. When steam condenses in radiators the thermal members cool and contract. This automatically opens the VacUstats, permitting vacuum in Expansion Tank and air piping to draw out any air which may have accumulated; also to pull more steam into the radiators. When steam again reaches the VacUstats they close automatically, and as this operation is continuous, *every radiator is always full of steam*.

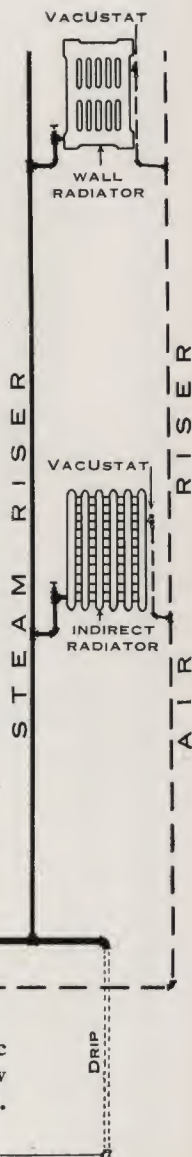
The RELIABLE Air Line Vacuum Heating Equipment makes every radiator always do its full duty, which *results in thorough and even heating*, at all times. In ordinary steam heating plants steam cannot generate under 212° Fahrenheit; and invariably steam pressure must be created to force air out of the boiler, supply piping and radiators, before the steam can enter the radiators. With RELIABLE Equipment steam is generated at less than 212° Fahrenheit, and as air resistance is eliminated, no fuel is wasted to produce steam pressure for driving out the air. With our equipment *much less fuel* is burned to provide ample heat than is required by an ordinary steam plant. In the coldest weather not over a pound or two of steam is necessary, and in mild winter weather sufficient heat is secured with vacuum instead of pressure in the boiler. In many cases plenty of heat is obtained in zero weather with vacuum in the boiler, and *pressure is not created all winter*. With our equipment heat reaches all the radiators instantly, and *quick heating is always insured*. The VacUstats absolutely prevent loss or escape of steam.

able Electric Vacuum Pump and Equipment. See page 31 for method

LY MAIN
LINE

hart shows a method of installing the Reliable Air Line Electric m Heating Equipment, when used with a one pipe low re steam plant. It is not intended for a working plan or layout.

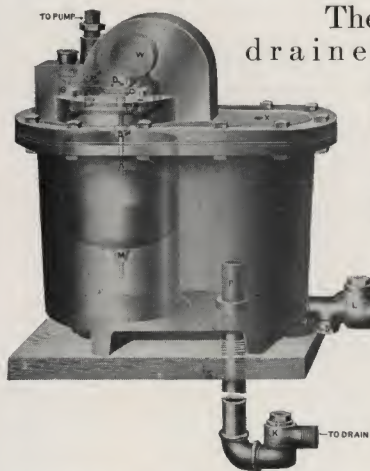
TURN LINE



THE RELIABLE AIR LINE

AIR LINE SEPARATOR No. 1969

The No. 1969 Separator is used only with RELIABLE Hydraulic Outfits, Nos. 102, 104 and 106, to prevent foreign matter and drip from the air lines being drawn into the vacuum pumps.



The No. 1969 Separator is drained automatically, the operation being as follows:

Before operating the system, plug at "X" should be removed and two or three quarts of water poured through opening, and the water will remain at top of

pipe "P." When vacuum pump is started, air and any drip is drawn out of the system, and strainer "B" on Separator catches any foreign matter. The air is thoroughly filtered and cooled by passing through the water in Separator. The drip from the air lines is automatically retained in Separator, and *cannot* enter air line leading to the vacuum pump. Check valve "K" on drain is kept closed by the vacuum, but when the tank is full this valve opens, automatically draining Separator. When the pump is not in operation check valve "L" is automatically closed by the water in Separator, so air cannot get back into the system through the Separator.

It is seldom necessary to clean the Separator more than once during a heating season. It is easily cleaned. Unscrew cap "S" on inlet connec-

VACUUM HEATING EQUIPMENT

tion, and flush by pouring water in opening "X" at top of Separator.

The No. 1969 RELIABLE Separator is perfect in operation; requires no attention; and is very durable. It is included with RELIABLE Hydraulic Air Line Outfits, Nos. 102, 104 and 106. A wood shelf and two iron brackets are furnished, for mounting.

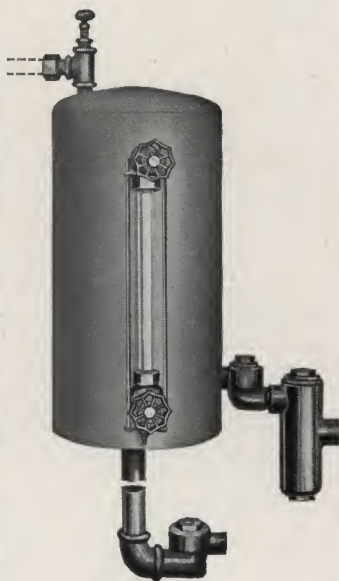
AIR LINE SEPARATOR No. 1979

The No. 1979 Separator is included with RELIABLE Hydraulic Outfit No. 101 only. Its purpose is to prevent foreign matter and drip from the air lines being drawn into the pump, same as the No. 1969 Separator described on preceding page.

Before operating the system, plug in tapping at top of Separator should be removed and water poured through the opening until it appears at bottom of the gauge glass.

Draining is necessary when the gauge glass shows the tank is two-thirds full. To drain, shut off the vacuum pump, open vent valve at the top, and the Separator will drain itself automatically.

The No. 1979 Separator is easily cleaned. Remove cap between tank and strainer, then pour water through the tapping at top of tank, and the Separator will be properly flushed.



AUTOMATIC CUT-OFF AND VACUUM CONTROLLER No. 1919

The Automatic Cut-off and Vacuum Controller is used with **RELIABLE** Hydraulic Vacuum Pumps to insure their automatic operation, and to maintain the desired vacuum in a heating system. When the proper degree of vacuum has been created, the Automatic Cut-off, by means of the Vacuum Controller, automatically stops the pump. When the vacuum is lowered 2 inches, the pump is automatically started.

The Automatic Cut-off and Vacuum Controller is *positive-acting*, and always maintains the desired vacuum. It permits the pump to operate *only* when necessary, so city water is never wasted. The Vacuum Controller is easily adjusted for any range of vacuum.

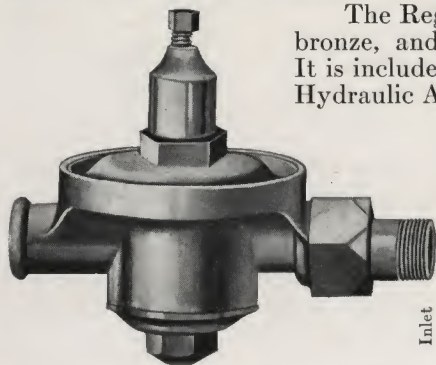
The Automatic Cut-off and Vacuum Controller is very simple, having no complicated parts to cause trouble. It is durably constructed, being made of solid bronze.

The Automatic Cut-off and Vacuum Controller is shown on page 31. It is included with all **RELIABLE** Air Line Hydraulic Outfits.

CITY WATER PRESSURE REGULATOR

This Pressure Regulator must always be used where the city water pressure exceeds 50 pounds. It should also be used in cities where the water pressure is suddenly increased for fire purposes, etc.

By simply turning a set screw at the top of the Regulator, the water can be regulated to any desired pressure, which will then be maintained.



The Regulator is made of solid bronze, and will last indefinitely. It is included with all **RELIABLE** Hydraulic Air Line Outfits.

Size of Connections:
No. 357 Regulator— $\frac{1}{2}$ inch connections, for Nos. 101, 102 and 104 **RELIABLE** Hydraulic Vacuum Pumps.

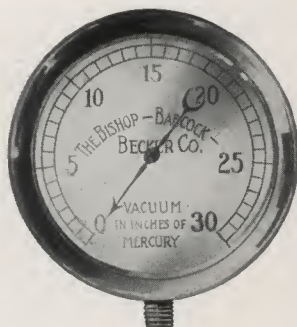
No. 367 Regulator— $\frac{3}{4}$ inch connections, for No. 106 **RELIABLE** Hydraulic Vacuum Pump.

VACUUM HEATING EQUIPMENT

RELIABLE VACUUM GAUGE

A Vacuum Gauge is always included with **RELIABLE** Air Line Outfits. It is used to show the degree of vacuum in a heating system.

The **RELIABLE** Vacuum Gauge is substantially made, and will last indefinitely. It has a non-corrosive movement, mounted direct on the socket. The movement cannot be thrown out of adjustment when Gauge is being installed. The dial is graduated to 30 inches vacuum.



Diameter of dial, $3\frac{1}{2}$ inches; $\frac{1}{4}$ -inch thread connection; iron case, brass rim.

RELIABLE COMPOUND GAUGE



We recommend the use of a **RELIABLE** Compound Gauge on low pressure boilers. It shows whether steam pressure or vacuum is in boiler.

This gauge also has a non-corrosive movement, which is mounted direct on socket. The movement cannot be thrown out of adjustment when Gauge is being installed. The dial is graduated to 15 pounds steam

pressure on one side and 30 inches vacuum on the other.

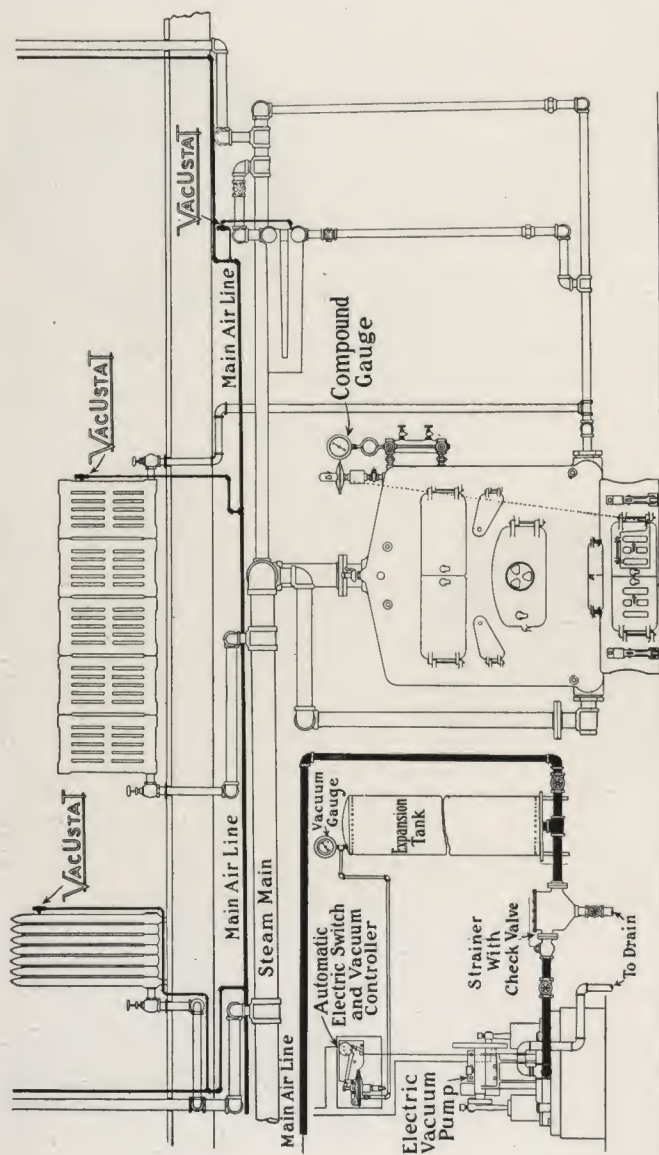
A Compound Gauge is not included with **RELIABLE** Air Line Outfits, but is furnished at extra charge.

Diameter of dial, $3\frac{1}{2}$ inches; $\frac{1}{4}$ -inch thread connection; iron case, brass rim.

RADIATORS AND COILS

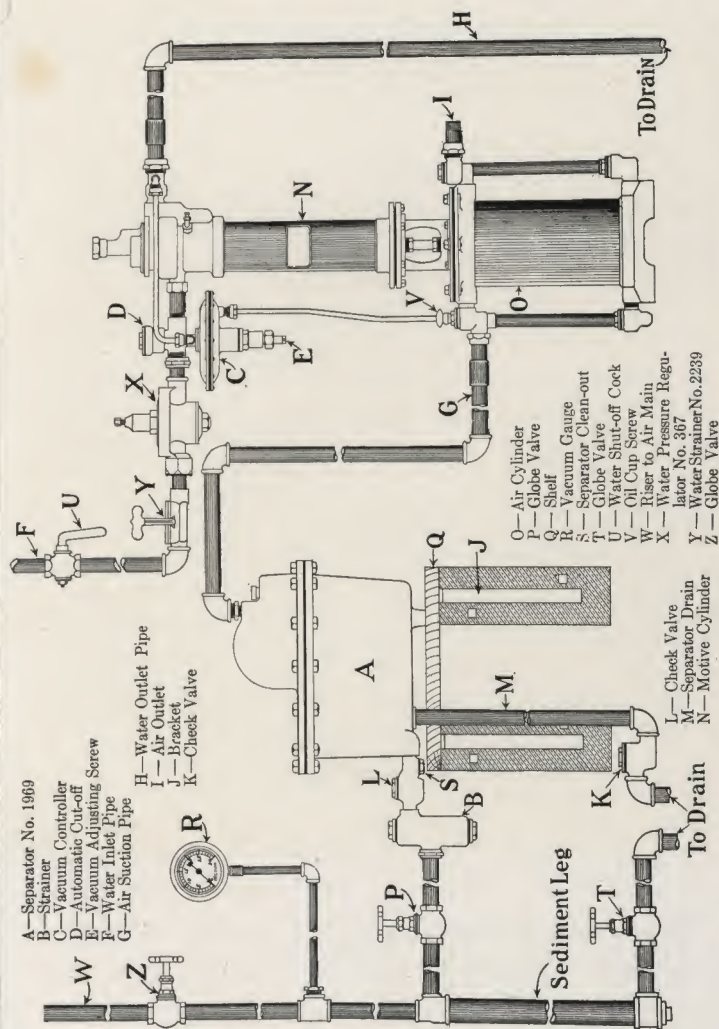
Standard steam radiators, either direct or indirect, may be used with **RELIABLE** Air Line Vacuum Heating Equipment. Graded coils may also be used. The same rating applies as in ordinary steam heating.

THE RELIABLE AIR LINE



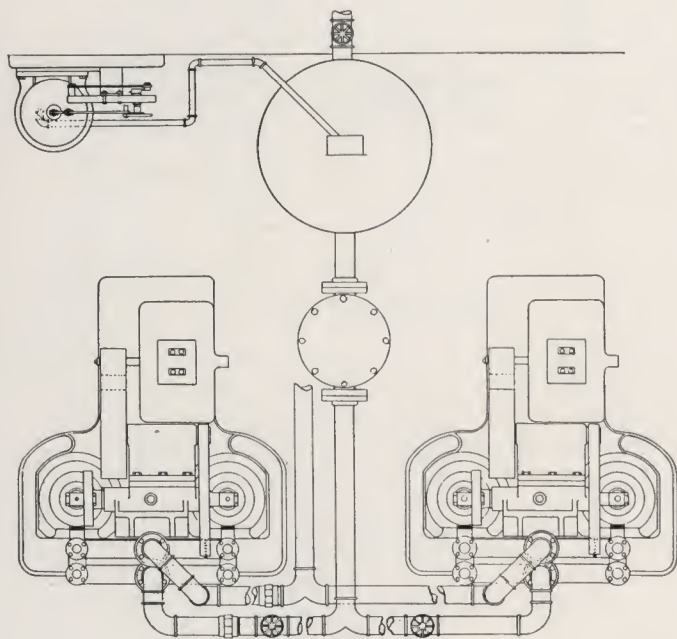
Method of installing a RELIABLE Air Line Electric Vacuum Pump and Equipment, with a one and two pipe steam plant.

VACUUM HEATING EQUIPMENT



Method of Installing No. 106 RELIABLE Hydraulic Vacuum Pump and Equipment

RELIABLE DUPLEX AIR LINE
ELECTRIC VACUUM PUMP
INSTALLATION



Top View

The above illustration shows method of cross-connecting two **RELIABLE** Electric Vacuum Pumps for use with steam heating systems having a larger amount of radiation than one pump can handle. Duplex installations are also used where a reserve unit is desired.

THE RELIABLE RETURN LINE VACUUM HEATING EQUIPMENT

The RELIABLE Return Line Vacuum Heating Equipment is used in connection with a low pressure steam heating plant to provide quick, thorough and even heat circulation, at any desired temperature, and in any kind of weather, with a great fuel saving. Its use eliminates hissing radiators, leaky vent valves, hammering, and all danger of freezing; and prevents loss or escape of steam—all the steam is utilized for heating.

The Return Line Equipment, by means of an Electric Vacuum Pump, creates and maintains a partial vacuum in a heating system, which quickly draws out the air, and pulls steam into all radiators. *This means rapid heating throughout the entire system.*

The Vacu-Traps (one is placed on return end of each radiator) allow air to be drawn from the system, but when steam reaches them they close automatically, *so steam cannot escape.* When condensation accumulates in radiators the Vacu-Traps open automatically, permitting the pump to draw out the condensation and any air, and to pull more steam into the radiators. Every one is forced to do its full duty, *which results in thorough and even heating.*

The Vacu-Graduate Packless Valves (one is placed on supply end of each radiator) enable the radiators to be entirely or only partially heated. Rooms can be heated independently, and *just the desired temperature can be maintained in each room, regardless of the weather conditions.*

The vacuum extends to the boiler and enables steam to generate at less than 212° Fahrenheit, which is an impossibility with the ordinary steam plant. No fuel is burned (wasted) to produce

THE RELIABLE RETURN LINE

steam pressure for driving air out of the system before steam can enter and circulate properly, as is the case with the average plant. With our equipment ample heat is usually secured with vacuum instead of pressure in boiler. In many cases (in climates where the temperature drops to zero) it has been unnecessary to create steam pressure all winter. These are reasons why *RELIABLE Equipment reduces fuel bills considerably.*

With our Return Line Equipment, air vent valves on radiators are not required. This means that *hissing, sputtering radiators are eliminated*, and there can be no leakages to spoil the furnishings: and furthermore air in the rooms is not fouled by odors from the boiler, piping and radiation. The Vacuum Pump always pulls the condensation out of radiators and return piping, so there can be no hammering or banging noises, and *absolutely no danger of freezing.*

The RELIABLE Return Line Equipment is automatic and noiseless; a detailed description of its operation is given on pages 56 and 57. All our equipment is very simple, having no complicated parts to cause trouble by getting out of order. It is thoroughly tested and properly adjusted, at our factory. See our guarantee on page 2.

The Return Line Equipment is installed at low cost; the operating expense is very low.

WHAT THE EQUIPMENT CONSISTS OF

The RELIABLE Return Line Equipment consists of an Electric Vacuum Pump with accessories as listed on page 38, Automatic Air Separating Tank (if returns are made to low pressure boiler, closed receiving tank or closed feed water heater), a Vacu-Trap for each radiator or coil and one for each main and riser drip, a Vacu-Graduate Packless Valve for each radiator or coil, and a Compound Gauge for the boiler.

The functions of RELIABLE Equipment, how it is installed, etc., is clearly explained on pages 56 and 57.

Note:—The Electric Vacuum Pumps can be used in any style or size building, and with the accessories comprise complete automatic working outfits.

ADAPTABILITY

The RELIABLE Return Line Vacuum Heating Equipment is equally efficient for new or old two pipe low pressure steam heating plants, in any style or size building. See page 37 for using the Return Line Equipment with plants already installed.

The RELIABLE Return Line Equipment works equally well with plants fed by steam from a low pressure boiler; steam from a central station; exhaust steam; or steam from a high pressure boiler, if reduced and regulated not to exceed 15 pounds pressure.

When our equipment is used with a plant fed by exhaust steam, the vacuum pump keeps the system free from condensation and air, and pulls steam into all radiators. This naturally reduces back pressure on steam engines or pumps, thereby increasing their efficiency and saving considerable fuel. As the engines or pumps seldom operate all of the time, it is usually necessary to bypass live steam into an exhaust steam system, so that a constant supply of steam is available.

Where steam from a central station is used, the pressure is often very low at the ends of mains and laterals, and in such cases the steam will not enter and circulate in the ordinary heating system. RELIABLE Return Line Equipment positively overcomes this trouble, as the vacuum pump eliminates air resistance and pulls the steam into every radiator.

RELIABLE Return Line Equipment is used in many of the most prominent buildings throughout the United States. Send for list of the installations in your vicinity.

THE RELIABLE RETURN LINE

LOW COST OF INSTALLATION

RELIABLE Return Line Vacuum Heating Equipment is manufactured complete at our factory. We thoroughly test our equipment, and the adjustments are *properly* made. Therefore, when RELIABLE Vacuum Heating Equipment arrives at a building, it is ready to be installed—*no bother or delays are occasioned in making adjustments when installing.*

There is nothing complicated about the Return Line Equipment, and the installation is accomplished *quickly at low cost.*

When a RELIABLE Return Line Outfit is used in connection with a two pipe steam heating plant already installed, practically all the old equipment is utilized. See page 37 for further particulars.

LOW UPKEEP OR OPERATING EXPENSE

As RELIABLE Electric Vacuum Pumps have large capacity, air and all condensation is rapidly drawn out of a heating system, and the proper degree of vacuum quickly created. The vacuum held in the expansion tank and return piping assists the pump to keep system free from air and condensation, *insuring less frequent pump operation.* In a tight system a RELIABLE Vacuum Pump operates not more than $\frac{1}{3}$ of the time, which explains why the operating expense is very low.

The Vacuum Controller which operates the Automatic Electric Switch is positive-acting—the vacuum pump can start and operate only when necessary.

VACUUM HEATING EQUIPMENT

A STEAM HEATING PLANT ALREADY
INSTALLED IS MADE FULLY EFFI-
CIENT BY THE RELIABLE EQUIPMENT

The RELIABLE Return Line Vacuum Heating Equipment can readily be applied to two pipe low pressure steam heating plants already installed, and nearly all of the old equipment is utilized.

The following equipment and changes are required:

The RELIABLE Equipment consists of an Electric Vacuum Pump, of sufficient capacity, with accessories as listed on page 38, Automatic Air Separating Tank (if returns are made to the boiler), a Vacu-Trap for each radiator or coil and one for each main and riser drip, a Vacu-Graduate Packless Valve for each radiator or coil, and a Compound Gauge for the boiler.

All the RELIABLE Equipment is thoroughly illustrated and described in this catalog. See detailed chart on pages 56 and 57, which shows proper method of installing.

If the supply and return piping is of ample size and properly installed, it does not have to be disturbed.

The radiators and coils are utilized.

The boiler is always used, unless the capacity is insufficient.

Note: — It is important that all the connections are made perfectly tight. The system should be thoroughly cleaned before being put in operation.

THE RELIABLE RETURN LINE

RELIABLE RETURN LINE ELECTRIC OUTFITS

Nos. 2779, 122, 123, 124 AND 125

These outfits comprise a complete automatic working unit and consist of the following:

Vacuum Pump including Base, Check Valves, Belt, Special Automatic Belt Tightener and Grease Cups.

Electric Motor, either direct or alternating current.

(Specify voltage if direct current motor is required, and voltage and cycles if alternating current. We furnish single phase alternating current motors *only*, as they operate on 2 or 3-phase circuits, whereas 2 or 3-phase motors will not run on single phase current.)

Automatic Electric Switch and Vacuum Controller No. 1859.

Strainer, (No. 2249 with No. 2779 Outfit, No. 2279 with No. 122 and 123 Outfits, and No. 2289 with Outfits No. 124 and 125).

Expansion Tank.

Vacuum Gauge.

Flanged Union Connections.

Note:— Please bear in mind that our heating engineers are at your service, and are always willing to give you information; also to help you select RELIABLE Equipment that will give you the best and most economical service.

VACUUM HEATING EQUIPMENT

RELIABLE
RETURN LINE
ELECTRIC
VACUUM
PUMP
No. 2779



See page 38 for list of equipment included with this pump

The No. 2779 RELIABLE Electric Vacuum Pump is a single-acting, plunger type pump of new design. It operates smoothly and evenly, without noise. The maximum capacity is 2000 square feet of direct radiation.

The illustration above shows the No. 2779 Pump has no complicated parts to get out of order.

See detailed description on next page

THE RELIABLE RETURN LINE

DETAILED DESCRIPTION OF No. 2779 RELIABLE RETURN LINE ELECTRIC VACUUM PUMP

Capacity. This pump will handle heating systems having up to 2000 square feet of direct radiation.

Electric Motor, either direct or alternating current, is of standard make— $\frac{1}{3}$ horse power. It starts easily under full load, and will operate on a voltage variation of 10 per cent. We furnish single phase alternating current motors *only*, as they operate on 2 or 3-phase circuits, whereas 2 or 3-phase motors will not run on single phase current.

Low Cost for Current. With a tight system the No. 2779 Pump has occasion to operate but seldom, and as the motor is only $\frac{1}{3}$ horse power, the cost for electric current is exceptionally low.

Special Automatic Belt Tightener always keeps the belt tight, and prevents it slipping—there is no lost motion, or binding. Friction and wear are reduced to a minimum.

Cylinder is of the vertical single-acting type, cast in one piece with the stand.

Piston. The heavy bronze piston is of the simple plunger type. The connecting rod is iron, with bronze bushings. The main shaft bearings are phosphor bronze.

Valves. The two valves are held in place by a phosphor bronze spring, which insures easy operation and positive seating. The valves are easily accessible. The valves are composition, and are very durable, either side may be used. The valve seat is removable, and is made of bronze.

Base is heavy iron, cast in one piece. It has a gutter around the edge to catch any drip.

Lubrication. The bearings have large grease cups, which require only occasional filling.

*See page 78 for specifications and dimensions
of the No. 2779 Electric Pump*

VACUUM HEATING EQUIPMENT

RELIABLE RETURN LINE ELECTRIC VACUUM PUMPS Nos. 122 AND 123



See page 38 for list of equipment included with these pumps

NOTE THE SIMPLICITY

The RELIABLE Electric Vacuum Pumps are positive-acting, and require much less power than any other vacuum pump. The cost for current is only $\frac{1}{3}$ to $\frac{1}{5}$ that of other makes. RELIABLE Pumps are remarkably simple in construction, having no small or complicated parts to get out of order, causing trouble and costly delays.

See page 43 for complete description

THE RELIABLE RETURN LINE

RELIABLE RETURN LINE ELECTRIC VACUUM PUMPS Nos. 124 AND 125



See page 38 for list of equipment included with these pumps

The RELIABLE Electric Vacuum Pumps are automatic; noiseless; and draw condensation and air continuously when in operation. With their double speed reduction, they work so perfectly that they use but $\frac{1}{3}$ to $\frac{1}{5}$ the power required to operate other vacuum pumps. The cost for electric current is lower in proportion.

See next page for detailed description

VACUUM HEATING EQUIPMENT

DESCRIPTION OF RELIABLE RETURN LINE ELECTRIC VACUUM PUMPS

Nos. 122, 123, 124 and 125

The **RELIABLE** Pumps are simple in design and durably constructed, and can always be depended on to operate satisfactorily, year in and year out.

Following is a detailed description:

Cylinders. These pumps have two vertical, single-acting cylinders, which always draw air and condensation steadily when in operation. The cylinders are heavy iron.

Large Capacity. The pumps have unusually large capacity. See page 78 for number square feet radiation each pump is capable of handling.

Electric Motors are furnished, either direct or alternating current, of standard make. They start easily under full load, and will operate on a 10 per cent variation in voltage. We furnish single phase alternating current motors *only* as they operate on 2 or 3-phase circuits, whereas 2 or 3-phase motors will not run on single phase current.

Special Automatic Belt Tightener always keeps belt tight, and prevents it slipping—there is no lost motion, or binding. Friction and wear are reduced to a minimum.

Pistons are of the simple plunger type, and are made of heavy iron. The connecting rods are iron, with bronze bushings.

Valves are extra large, designed especially for handling air and condensation. The valves always operate and seat perfectly; are noiseless; and are readily accessible. They are made of a special composition, which is exceptionally durable. The bronze valve seats are removable.

Bearings. The main shaft bearings and pinions are solid bronze.

Base is heavy iron, cast in one piece. It has a gutter around the edge in form of a drip pan, which keeps oil off floor.

Lubrication. All bearings have large grease cups, which require only occasional filling.

See page 78 for specifications and dimensions of these Vacuum Pumps

**AUTOMATIC ELECTRIC SWITCH AND
VACUUM CONTROLLER No. 1859**

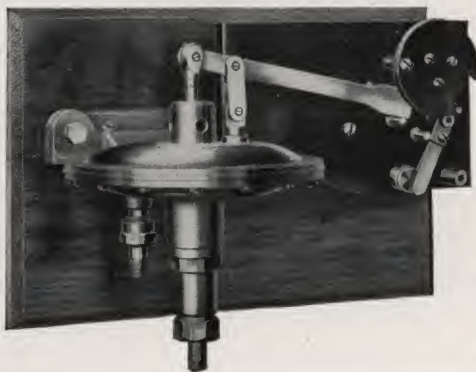
The Automatic Electric Switch and Vacuum Controller is used with RELIABLE Electric Vacuum Pumps to insure their automatic operation, and to maintain the desired vacuum in a heating system. When the proper degree of vacuum is created, the Automatic Electric Switch, by means of the Vacuum Controller, automatically stops the pump. When the vacuum is lowered 2 inches, the pump is automatically started.

The action of the Vacuum Controller is *positive*, and the proper degree of vacuum is *always* maintained. It is easily adjusted for any range of vacuum. The Automatic Electric Switch has only one knife blade, and a *perfect* connection is assured.

The Automatic Electric Switch is very substantially made, and is mounted on a neat slate panel. The Vacuum Controller is constructed of heavy bronze, and is mounted with Automatic Electric Switch on a wood panel.

The Automatic Electric Switch and Vacuum Controller No. 1859 is very simple; has no parts to get out of order; and enables RELIABLE Electric

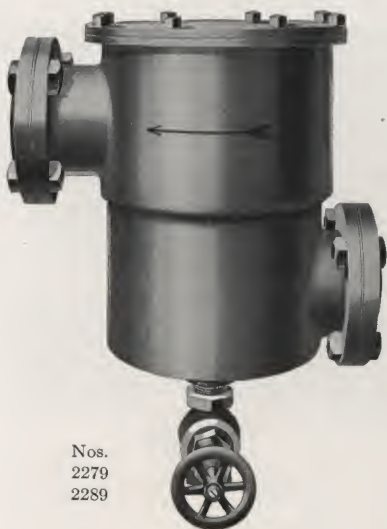
Vacuum Pumps to be operated very economically.



The Automatic Electric Switch and Vacuum Controller is included with all RELIABLE Return Line Electric Outfits.

VACUUM HEATING EQUIPMENT

RETURN LINE STRAINER



Nos.
2279
2289

A Strainer of large capacity is furnished with **RELIABLE** Return Line Outfits. All air and condensation passes through this Strainer, which prevents scale, grit, and other foreign matter entering vacuum pump.

The Strainer usually requires cleaning only once each heating season. It is cleaned by simply removing cover plate, opening discharge valve (furnished) at bottom, and flushing with water.

Note:—No. 2249 Strainer is furnished with Outfit No. 2779, No. 2279 with Outfits No. 122 and 123, and No. 2289 with No. 124 and 125 Outfits. The No. 2249 Strainer is shown on page 21.

EXPANSION TANK

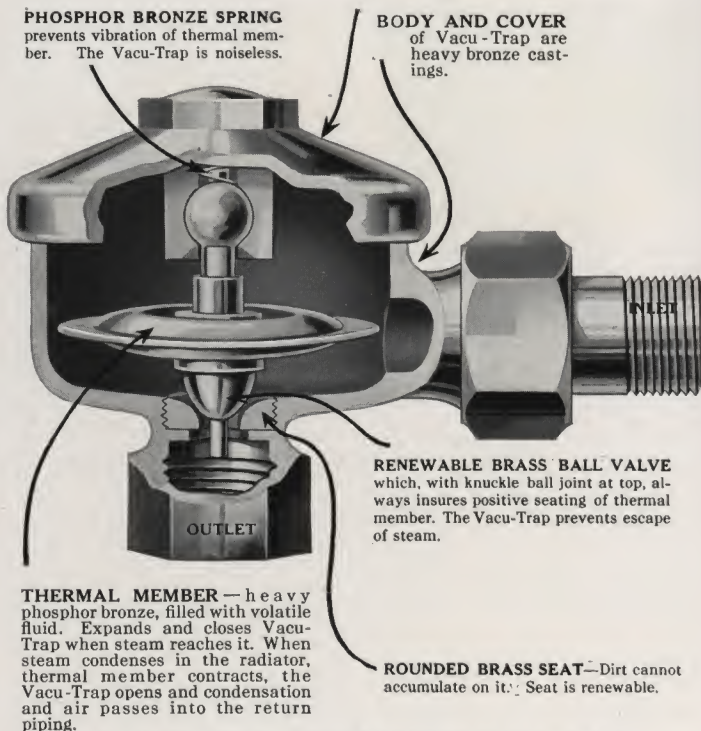
An Expansion Tank is used with **RELIABLE** Return Line Outfits to hold a steady vacuum in the heating system. The vacuum in Expansion Tank assists the pump to draw air and condensation from the system. *This insures additional economy.*

As the Automatic Electric Switch and Vacuum Controller is connected to Expansion Tank, a steady vacuum is always on the Vacuum Controller, which assures *perfect* operation of Automatic Electric Switch—the vacuum pump can operate only when necessary.

An Expansion Tank of proper size is always included with **RELIABLE** Return Line Outfits.

THE RELIABLE RETURN LINE

THE VACU-TRAPS WHAT THEY ARE—HOW THEY OPERATE

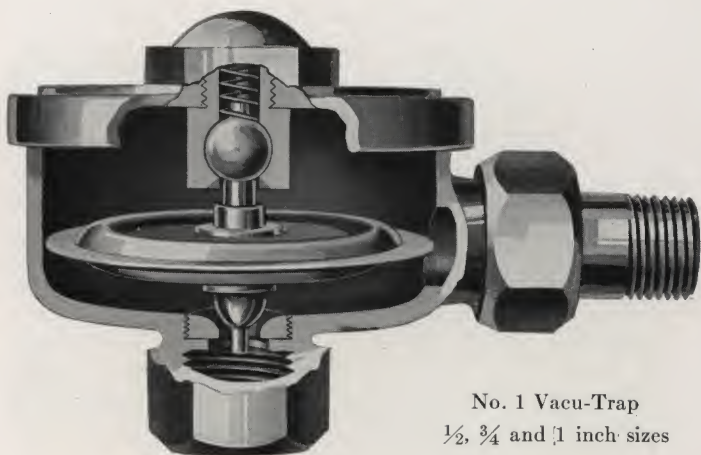


Little Wonder Vacu-Trap Made only in $\frac{1}{2}$ inch size

The Vacu-Traps are heavy bronze thermostatic valves which automatically keep a heating system free from air, and drain the radiators or coils of condensation, without loss or escape of steam.

One Vacu-Trap is placed on return end of each radiator or coil. The Vacu-Trap allows air to be drawn out of radiators, supply piping and boiler, but when steam reaches it, its thermal member expands, closing Vacu-Trap instantly. *The Vacu-Trap positively prevents steam entering the*

VACUUM HEATING EQUIPMENT



No. 1 Vacu-Trap

$\frac{1}{2}$, $\frac{3}{4}$ and 1 inch sizes

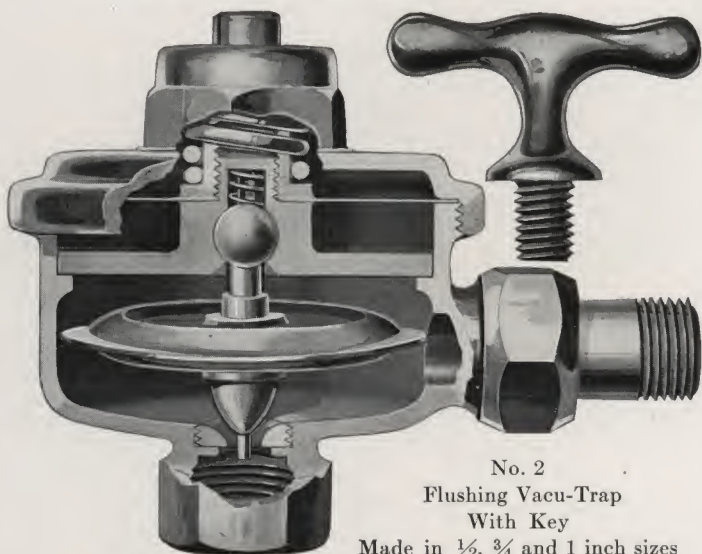
return line. When steam condenses in radiators or coils, condensation at 190 to 198 degrees, will contract the thermal member. This opens passage to return line, allowing *all* condensation and air to pass out quickly. The steam following again expands thermal member, which closes Vacu-Trap. All condensation is removed as fast as it accumulates, so *radiators or coils are always heated up to steam temperature.* The Vacu-Trap insures *thorough draining and quick air liberation* at all times.

The brass knuckle ball joint in Vacu-Trap supports the thermal member, and, together with brass ball valve at bottom, always insures *positive seating*, so *steam cannot escape.* A bronze compensating spring prevents vibration of the thermal member.

The Vacu-Traps make every radiator or coil do its full duty—fully efficient. They are *noiseless*, and the *most positive-acting and durable* return line valves made.

Note :— The Vacu-Traps are low pressure valves. We do not guarantee them when used where the pressure exceeds 15 pounds.

COMPARISON OF THE VACU-TRAPS



No. 2
Flushing Vacu-Trap
With Key

Made in $\frac{1}{2}$, $\frac{3}{4}$ and 1 inch sizes

The Little Wonder and No. 1 Vacu-Traps are identical in style of construction and operation, except that the Little Wonder Vacu-Trap is smaller.

The No. 2 Vacu-Trap is a flushing trap, and no change of valves or piping is necessary for cleaning the system. The knuckle ball joint at top of thermal member fits into a socket in a bronze crossbar. This crossbar rests on a shoulder in the body, and is held in place by a heavy phosphor bronze spring. A key is furnished with No. 2 Flushing Vacu-Traps, which, when inserted at top and turned by hand, raises crossbar and thermal member against the spring pressure enough to permit steam to blow freely through valve across the seat, cleaning radiation and Vacu-Traps thoroughly of all foreign matter, through a bypass to sewer. *Cleaning is accomplished without interfering with operation of the heating system.* After cleaning key

VACUUM HEATING EQUIPMENT

is removed, and the spring forces the crossbar back onto the shoulder, returning thermal member to its proper working position. A copper diaphragm fastened to the crossbar and made tight by the cover makes the No. 2 Vacu-Trap a packless valve of the best type.

Where exhaust steam is used for heating, there is always a certain amount of gummy cylinder oil in the steam, which tends to clog all valves in system. For such systems the No. 2 Vacu-Trap is especially valuable.

The No. 2 Flushing Vacu-Trap provides *thorough, instantaneous and most economical* cleaning. It is the only valve of its kind.

CONSTRUCTION OF THE VACU-TRAPS

The body and cover of the Vacu-Traps are heavy bronze castings. (See description of the 1¼" and 1½" No. 1 Vacu-Traps on next page.) The thermal members are heavy gauge phosphor bronze, constructed in strongest possible manner. The thermal members are filled with a volatile liquid which expands or contracts them, as temperature raises or lowers. The removable seat at bottom of Vacu-Traps is solid brass, and rounded, so that dirt cannot accumulate on it.

The superior design and extra heavy construction of Vacu-Traps insures durability under *expansion and contraction*, without danger of breakage.

The Vacu-Traps are made in ½", ¾", 1", 1¼" and 1½" sizes. The ½" ¾" and 1" sizes are furnished in brass or nickel plated finish. The 1¼" and 1½" Vacu-Traps are painted black.

See page 79 for dimensions and weights of the Vacu-Traps
Roughing in dimensions are given on page 81

PERMANENTLY ADJUSTED

Each Vacu-Trap is given a 5 hour working test, and is *properly and permanently* adjusted at our factory. *No adjustments are necessary when installing, or afterward.*



No. 1 VACU-TRAP

(1¼ and 1½ inch sizes)

These low pressure Vacu-Traps are designed especially for draining condensation and relieving the air from blast or dryer coils. They can also be used with indirect radiation. The style of construction and operation is identical with the other Vacu-Traps, described on the four preceding pages.

The openings in the seats are full $\frac{7}{8}$ inch in diameter, which always insures rapid draining of condensation and quick air relief. The covers of these Vacu-Traps are bolted to the body and can be quickly removed without breaking connections. They can be installed where the space is very limited on account of the flanged screw connections.

These Vacu-Traps are exceptionally durable. The body and cover are heavy iron castings, securely fastened together with brass cap screws, with a washer between. The thermal member is heavy gauge phosphor bronze. The rod brass seat and all working parts are renewable. As the above illustration shows, part of the flanged connection is cast in one piece with the body, making the connection very substantial.

*Note:—See page 79 for dimensions and weights of these Vacu-Traps.
Roughing in dimensions are given on page 81.*

THE VACU-GRADUATE PACKLESS RADIATOR VALVE

(With wheel-handle)

The Vacu-Graduate Packless Valve with wheel-handle is a new quick opening radiator supply valve, designed particularly for use on bottom feed radiators or coils. It is fully opened or closed by a quarter turn of the wheel-handle.

A sectional illustration of the Vacu-Graduate Valve is given below, and its construction and operation is thoroughly explained.

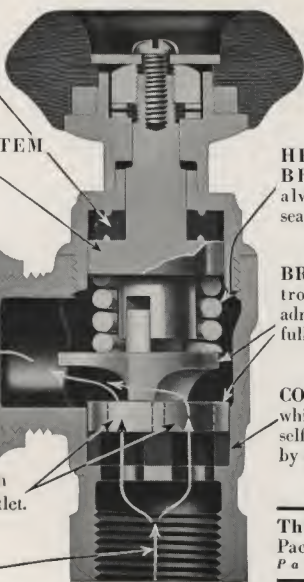
COMPOSITION SEAT
which makes the
Vacu-Graduate Valve
packless.

BRONZE VALVE STEM
easily removable.

OUTLET of steam
to radiator or
coil.

PORTS in valve through
which steam passes to outlet.

INLET for steam.



A QUARTER TURN
of this wheel-handle
fully opens or closes
the valve.

**HEAVY PHOSPHOR
BRONZE SPRING**—
always maintains tight
seating of valve.

BRONZE VALVE—con-
trols amount of steam
admitted by partially or
fully opening ports in seat.

COMPOSITION SEAT on
which valve turns. It is
selfcleaning, and unaffected
by steam.

**The Vacu-Graduate
Packless Radiator Valve
Patent Applied For**

$\frac{3}{4}$ inch size

A Vacu-Graduate Packless Valve with wheel-handle is installed on the supply end of each bottom feed radiator or coil. While this is a quick-opening supply valve and does not have a graduated dial, it can also be used as a graduating valve. The main reason for equipping this valve

THE RELIABLE RETURN LINE

with a wheel-handle is to eliminate danger of breakage, as people are bound to step on these valves to reach a window shade, etc.

The Vacu-Graduate Valve is self-cleaning. The valve always turns on the seat, so dirt cannot accumulate and wear seat, as is the case with the majority of radiator supply valves. The seat above the valve stem makes the Vacu-Graduate Valve packless, and it is always held tightly in place by an extra large, heavy spring. The spring also maintains a tight seating of the valve—it cannot leak. As the sectional illustration shows, there are no complicated ports to set or clog; no packings to wear. The Valve operates easily at all times, and there is no chance for it to stick.



1, 1¼ and
1½ inch sizes

The Vacu-Graduate Packless Valve is in a class by itself for durability. The body, valve and valve stem are heavy bronze. The spring is phosphor bronze. The seats are made of a special composition, unaffected by steam. The hardwood wheel-handle is shaped to fit the hand, and cannot work loose.

Another big advantage of the Vacu-Graduate Valve is the fact that it is properly and *permanently adjusted* at our factory—*no adjustments are necessary when installing or later.*

The Vacu-Graduate Packless Valve is made in ¾", 1", 1¼" and 1½" sizes, suitable for any size radiator or coil. It is especially attractive in design, and heavily nickel plated. We can furnish lock-shield if desired, without additional charge. See page 80 for dimensions and weights.

Note — Vacu-Graduate Valves with wheel-handle are used on bottom feed radiators or coils. For top feed we recommend Valves with graduated dial and lever-handle, described on pages 67 to 70 inclusive. The latter can also be used for bottom feed if desired.

VACUUM HEATING EQUIPMENT

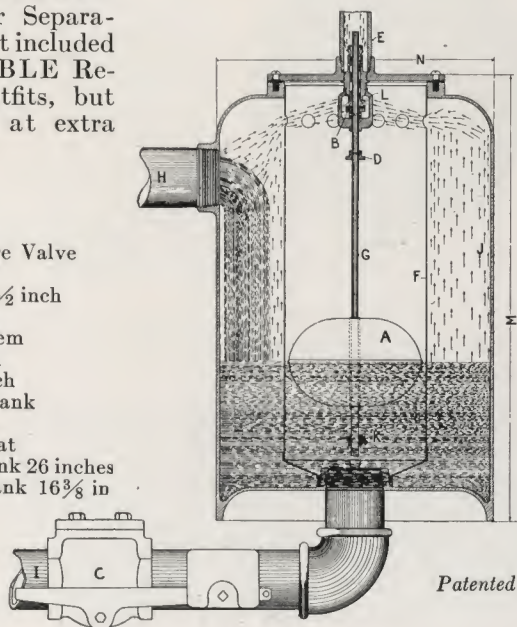
AUTOMATIC AIR SEPARATING TANK

The RELIABLE Automatic Air Separating Tank is part of RELIABLE Return Line Vacuum Heating Equipment when returns are made to low pressure boiler, closed receiving tank, or closed feed water heater. The apparatus consists of a heavy galvanized iron tank of proper size fitted with an air valve, float, and back pressure valve.

The air and condensation from the system are forced into this tank together by the pump. The air valve "B" remains open allowing the air to escape, while the condensation remains in tank. When tank is nearly full the float "A" automatically closes air valve and the pump then creates a pressure in tank. When this pressure is greater than pressure in the boiler, back pressure valve "C" automatically opens, and condensation passes into boiler. The air valve is kept closed by pressure in tank but is automatically opened by float when tank is nearly empty. This again allows air to escape, and boiler pressure closes back pressure valve automatically, preventing boiler water from backing up into tank. The operation is then repeated.

The RELIABLE Automatic Air Separating Tank is not included with RELIABLE Return Line Outfits, but is furnished at extra charge.

- A—Float
- B—Air Valve
- C—Back Pressure Valve
- D—Float Stop
- E—Air Vent—1½ inch
- F—Float Shield
- G—Air Valve Stem
- H—Inlet—3 inch
- I—Outlet—3 inch
- J—Galv. Iron Tank
- K—Float Stop
- L—Air Valve Seat
- M—Height of Tank 26 inches
- N—Width of Tank 16⅔ in



THE RELIABLE RETURN LINE

RELIABLE VACUUM GAUGE

A Vacuum Gauge is always included with RELIABLE Return Line Out-fits. It is used to show the degree of vacuum in a heating system.

The RELIABLE Vacuum Gauge is substantially made, and will last indefinitely. It has a non-corrosive movement, mounted direct on the socket. The movement cannot be thrown out of adjustment when Gauge is being installed. The dial is graduated to 30 inches vacuum.



Diameter of dial, 3½ inches; ¼-inch thread connection; iron case, brass rim.

RELIABLE COMPOUND GAUGE

We recommend the use of a RELIABLE Compound Gauge on low pressure boilers. It shows whether steam pressure or vacuum is in boiler.

This gauge also has a non-corrosive movement, which is mounted direct on socket. The movement cannot be thrown out of adjustment when Gauge is being installed. The dial is graduated to 15 pounds steam pressure on one side and 30 inches vacuum on the other.

A Compound Gauge is not included with RELIABLE Return Line out-fits, but is furnished at extra charge.

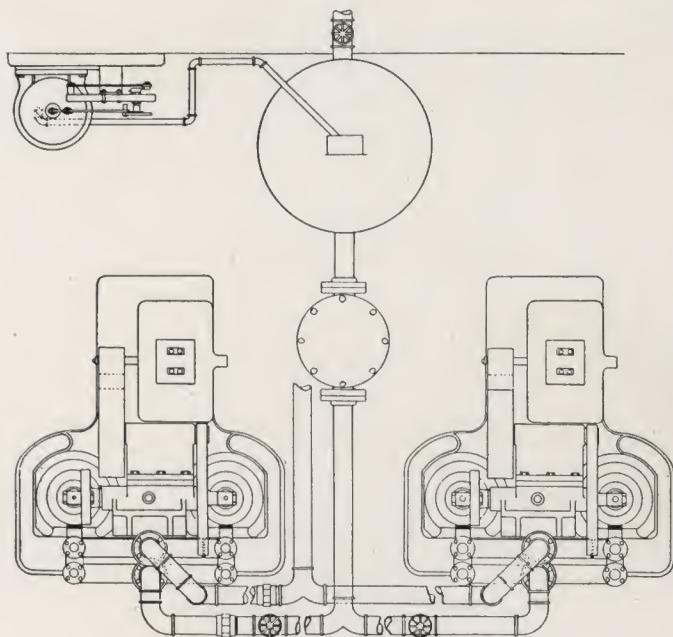


Diameter of dial, 3½ inches; ¼-inch thread connection; iron case, brass rim.

RADIATORS AND COILS

Standard steam radiators, either direct or indirect, may be used with RELIABLE Return Line Vacuum Heating Equipment. Wall, ceiling, blast and dryer coils may also be used. The same rating applies as in ordinary steam heating.

RELIABLE DUPLEX RETURN LINE ELECTRIC VACUUM PUMP INSTALLATION



Top View

The above illustration shows method of cross-connecting two RELIABLE Electric Vacuum Pumps for use with steam heating systems having a larger amount of radiation than one pump can handle. Duplex installations are also used where a reserve unit is desired.

DETAILED DESCRIPTION OF OPERATION OF ELECTRIC VACUUM H

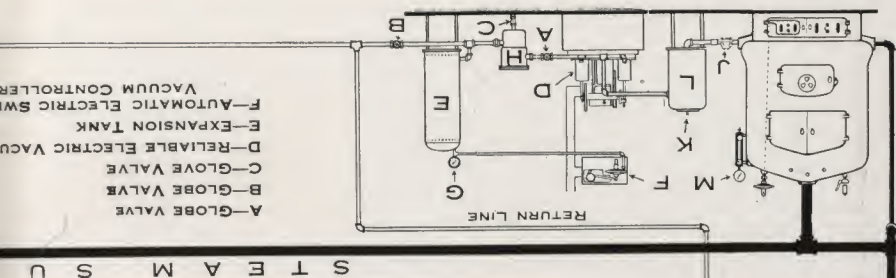
Refer to detailed chart, showing method of returning condensation to low pressure boiler. *This is not intended for a working plan.*

The boiler, boiler connections and steam supply main are the same as for an ordinary two pipe steam plant. The steam supply main is graded, and the end dripped to the wet return line. The return piping is smaller than is required for an ordinary plant, the sizes depending on the amount of radiation.

A Vacu-Trap is placed on the return end of each radiator and connected with return piping leading to Vacuum Pump "D." A Vacu-Trap is also installed on the drip from the steam supply main. A Vacu-Graduate Packless Valve is installed on the supply end of each radiator. The Vacu-Traps and Vacu-Graduate Valves are thoroughly described in this catalog. Expansion Tank "E" is connected to wet return line, before it enters Strainer. A globe valve "B" should be placed on wet return line before it reaches Expansion Tank connection, so Vacuum Pump, etc., can be valved off for testing. Vacuum Controller Switch "F" is connected to Expansion Tank, and Automatic Electric Switch "F" wired to motor and to fuse box. Vacuum Gauge "G" is installed on Expansion Tank. Strainer "H" is connected to wet return line and to Vacuum Pump. A globe valve "A" is placed on line between Strainer and Pump, so Pump can be valved off when necessary. The Strainer has a globe valve "C" on the drain, and this drain is piped to open sewer. Automatic Air Separating Tank "L" is connected to Vacuum Pump, and to boiler. The back pressure valve "J" furnished is installed on line between the Separating Tank and boiler. The air vent "K" may be piped to chimney or outside, if desired. All connections should be made perfectly tight.

The system should be thoroughly tested and cleaned, before being put in operation. Before operating, fully open globe valves "A" and "B," and close valve "C." The Vacuum Pump is started, as soon as fire under boiler is lighted, and immediately draws air from the system. The Pump discharges the air into Automatic Air Separating Tank, and it passes out of the air vent. The Pump will continue to operate until the desired vacuum is created in system, and then it is automatically stopped by means of the Automatic Electric Switch and Vacuum Controller. This is usually set to stop Pump when 7 inches of vacuum has been created, and start it again when vacuum drops to 5 inches. A vacuum can be maintained in system when cold, if desired. The vacuum in boiler enables steam to generate at less than steam

Note:—See charts on pages 58 and 59. The latter shows



ATION OF RELIABLE RETURN LINE HEATING EQUIPMENT

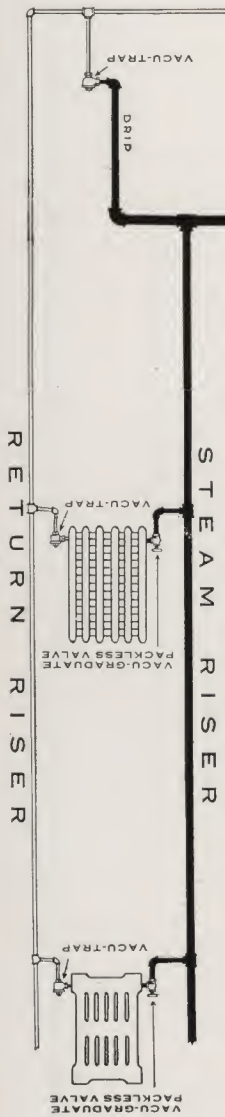
temperature. It is quickly pulled into the radiators, so rapid heating is assured throughout entire system. The instant steam reaches the Vacu-Traps their thermal members expand and closing Traps, so steam cannot pass into return line. When steam condenses in radiators, condensation at 190 to 198 degrees cools the thermal members, causing them to contract. This opens Vacu-Traps, and all condensation and air passes out quickly, after which steam following again expands thermal members closing the Vacu-Traps until more condensation accumulates. This operation is continuous, so all radiators are *always* heated up to full temperature. The condensation and air after passing out of radiators is drawn out of return piping (assisted by vacuum in Expansion Tank) through Strainer, into Vacuum Pump. The Pump forces condensation and air into Automatic Air Separating Tank, and when this Tank is full of condensation, and contains a greater pressure than boiler, the back pressure valve opens automatically, allowing condensation to pass into boiler. The air escapes through air vent in Separating Tank, in manner already described. As condensation never remains in system, there can be no hammering or banging noises, and no danger of freezing. Each radiator can be entirely or only partially heated by means of the Vacu-Graduate Packless Valves. Rooms can therefore be heated independently, and just the desired temperature can be maintained in each room, regardless of the weather conditions.

RELIABLE Return Line Vacuum Heating Equipment

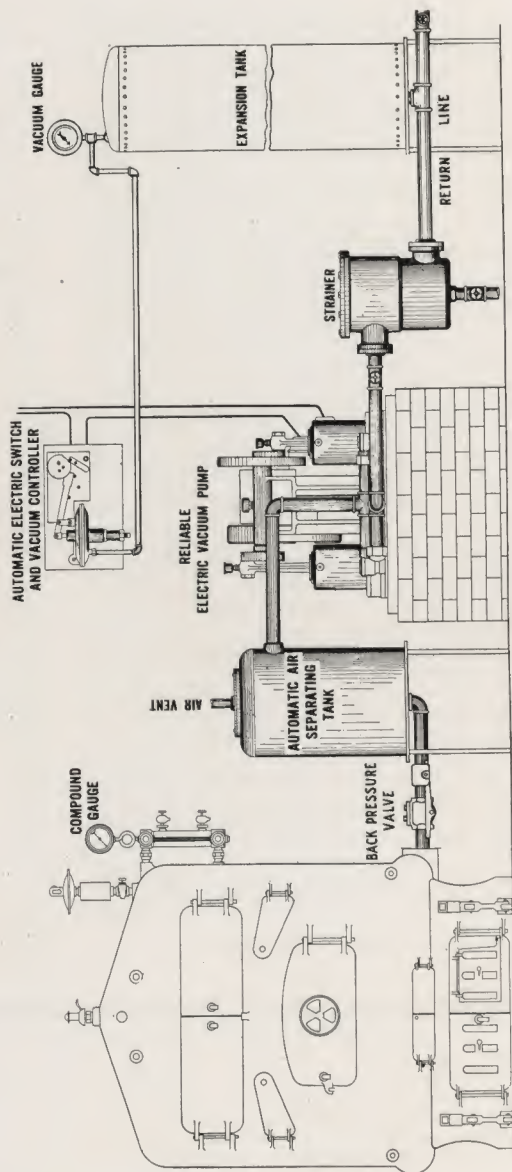
provides thorough and even heat circulation by forcing every radiator to give its full efficiency. Steam is generated at low temperature, so less fire is required, and less coal is burned to supply ample heat. In the coldest weather not over a pound or two of steam is necessary, and in mild winter weather sufficient heat is usually secured with vacuum instead of pressure in the boiler. In many cases plenty of heat is obtained in zero weather with vacuum in boiler, and pressure is not created all winter. Air resistance is eliminated, and steam is instantly pulled into all radiators or coils. No coal is burned to produce steam pressure for driving air out of the system before heat can enter and circulate properly. There are no leaky or hissing radiators. Air in the rooms is not fouled by odors. The Vacu-Traps prevent escape of steam—all the steam is utilized for heating. When No. 2 Flushing Vacu-Traps are used the system can be thoroughly cleaned at any time, without changing any valves or piping, and without interfering with operation of the system.

...method of returning condensation to open receiving tank.

- G—VACUUM GAUGE
- H—STRAINER
- J—BACK PRESSURE VALVE
- K—AIR VENT
- L—AUTOMATIC AIR SEPARATING TANK
- M—COMPOUND GAUGE

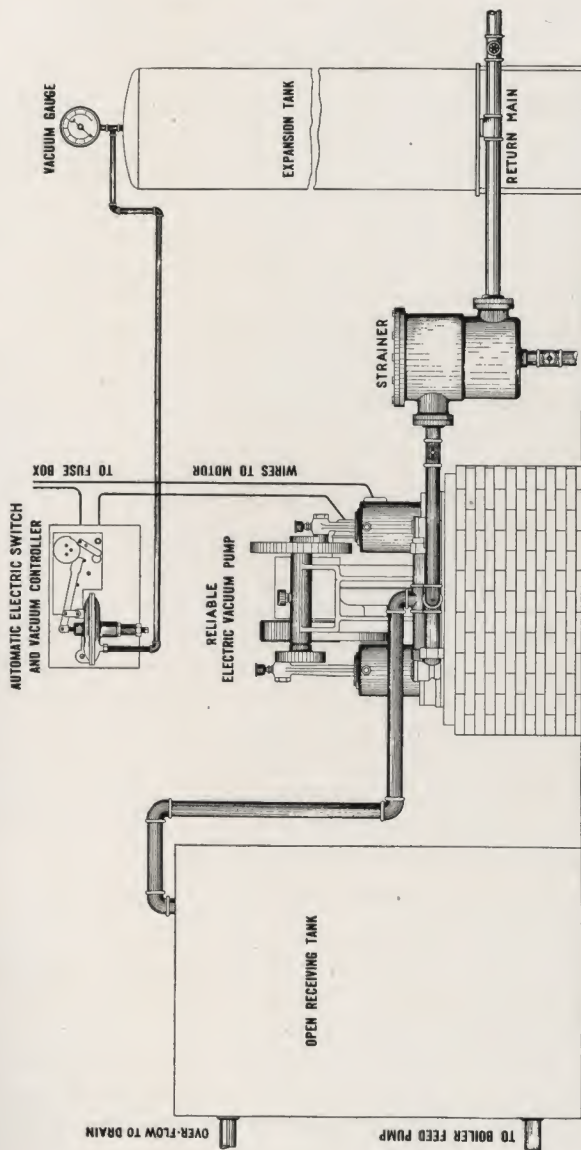


THE RELIABLE RETURN LINE



Method of installing RELIABLE Return Line Vacuum Heating Equipment for returning condensation to low pressure boiler

VACUUM HEATING EQUIPMENT



Method of installing RELIAIBLE Return Line Vacuum Heating Equipment for returning condensation to an open receiving tank

THE RELIABLE VACU-VAPOR HEATING EQUIPMENT

The RELIABLE Vacu-Vapor Heating Equipment is used in connection with a low pressure steam heating plant to provide thorough and even heat circulation, at any desired temperature, and in any kind of weather, with a big fuel saving. Its use eliminates hissing radiators, leaky vent valves, hammering, and prevents loss or escape of steam—all the steam is utilized for heating.

The vapor and steam condensing in the radiation (see page 64) automatically creates vacuum, which is utilized by the Vacu-Vapor Equipment to pull more vapor and steam into the radiators. As the condensing process is continuous the vacuum is maintained, so the radiators are always full of vapor and steam.

The Vacu-Traps (one is placed on return end of each radiator) close automatically when hot vapor and steam reaches them, *so steam cannot escape*. When condensation accumulates in radiators the Vacu-Traps automatically open, permitting the condensation and any air to pass into return piping. The radiators are always thoroughly drained and every one is forced to do its full duty, which results in *thorough and even heating at all times*.

The Vacu-Graduate Packless Valves (one is placed on supply end of each radiator) enable the radiators to be entirely or only partially heated. Therefore rooms can be heated independently, and just the desired temperature can be maintained in each room, regardless of weather conditions.

The vacuum extends to the boiler and enables vapor and steam to generate at a lower temperature than is possible with an ordinary steam plant. Through use of RELIABLE Equipment

H E A T I N G E Q U I P M E N T

air is always vented freely, and it is not necessary to create steam pressure for driving air out of the system, as is the case with the average plant. With our equipment ample heat is usually secured with vacuum instead of pressure in the boiler. In many cases (in climates where the temperature drops to zero) it has been unnecessary to create steam pressure all winter. These are reasons why the *RELIABLE Equipment reduces fuel bills.*

With our Vacu-Vapor Equipment air vent valves on the radiators are not required. This means that hissing, sputtering radiators are eliminated, and there can be no leakages to spoil the furnishings: and furthermore air in the rooms is not fouled by odors from the boiler, piping and radiation.

The **RELIABLE** Vacu-Vapor Equipment is entirely automatic and absolutely noiseless. See detailed description on pages 72 and 73. There is nothing complicated to cause trouble by getting out of order. All the Vacu-Vapor Equipment is *thoroughly tested and properly and permanently adjusted*, at our factory. No adjustments are necessary when installing, or afterward.

The cost of installing our Vacu-Vapor Equipment is remarkably low. See page 63.

WHAT THE EQUIPMENT CONSISTS OF

The **RELIABLE** Vacu-Vapor Heating Equipment consists of Vacu-Traps and Vacu-Graduate Packless Valves (one each for each radiator or coil), "4 V" Vacu-Vapor Vent Valves (for ends of the dry returns), Vacu-Checks (for ends of the steam mains), and a Compound Gauge for the boiler. Two well-balanced swing check valves are required for the wet return, beside the boiler.

The functions of the equipment, how it is installed, etc., is clearly explained on pages 72 and 73.

ADAPTABILITY

The RELIABLE Vacu-Vapor Heating Equipment is equally efficient for new or old two pipe low pressure steam heating plants, in any style or size building. See page 65 for using the Vacu-Vapor Equipment with plants already installed.

The RELIABLE Vacu-Vapor Equipment works equally well with plants fed by vapor or steam from a low pressure boiler; steam from a central station; exhaust steam; or steam from a high pressure boiler, if reduced and regulated not to exceed 15 pounds pressure.

When our equipment is used with a plant fed by exhaust steam, air is always liberated freely, so the steam circulates rapidly and thoroughly. The vacuum pulls steam into all the radiators, which naturally reduces back pressure on the steam engines or pumps, thereby increasing their efficiency and saving fuel. In view of the fact that steam engines or pumps seldom operate all of the time, it is usually necessary to bypass live steam into an exhaust steam system, so that a constant supply of steam is available.

Where steam from a central station is used the pressure is often very low at the ends of mains and laterals, and in such cases the steam will not enter the ordinary heating plant, on account of the air resistance. With the Vacu-Vapor Equipment air is freely liberated, so the steam readily enters the system and circulates thoroughly. The vacuum keeps the radiators full of steam.

RELIABLE Vacu-Vapor Heating Equipment is used in many of the most prominent buildings throughout the United States. Send for list of the installations in your vicinity.

LOW COST OF INSTALLATION

The RELIABLE Vacu-Vapor Heating Equipment is manufactured *complete* at our factory. It is thoroughly tested, and *properly* and *permanently adjusted* before being shipped. There is nothing complicated about the RELIABLE Equipment, and when it arrives at a building it is ready to be installed. No bother or delays are occasioned in making adjustments, and the *installation is accomplished quickly at very low cost.*

With our Vacu-Vapor Equipment it is seldom necessary to use steam supply piping or radiators of larger sizes than is required for an ordinary two pipe low pressure steam heating plant. The return piping is smaller, the sizes depending upon the amount of radiation.

When Vacu-Vapor Equipment is used in connection with a plant already installed, practically all the old equipment is utilized. See page 65 for further particulars.

NO UPKEEP OR OPERATING EXPENSE

With RELIABLE Vacu-Vapor Heating Equipment no vacuum pump or mechanical attachments of any kind are required, as it utilizes the vacuum which is automatically created through vapor and steam condensing in the radiation. (See page 64 for further particulars). For this reason there is absolutely no upkeep or operating expense.

HOW THE VACUUM IS OBTAINED

The vapor and steam condensing in radiators automatically creates vacuum, which is utilized by RELIABLE Vacu-Vapor Heating Equipment to generate vapor and steam at a lower temperature than is possible with an ordinary steam plant; and to pull heat into the radiators.

We will explain how vacuum is created through the condensing process. In steam heating plants water when heated to the boiling point is converted into steam. It takes only one cubic *inch* of water to make one cubic *foot* of steam—in other words steam occupies approximately 1728 times the amount of space that water does. When the radiators are filled with steam it naturally cools while transmitting its heat and reverts to its original state—shrinks to water. This is what is meant by the expression “steam condensing;” and vapor also condenses in the same manner. We have already stated that steam occupies a much greater space than water and after it condenses, the water of condensation drops to the bottom of the radiators, leaving a void which is nothing more nor less than vacuum.

With RELIABLE Vacu-Vapor Equipment the return ends of radiators are kept tightly closed by Vacu-Traps, and the vacuum must therefore exert its suction the other way—to the boiler. The vacuum enables vapor and steam to be generated at a lower temperature than is possible with an ordinary steam plant; and pulls more vapor and steam into the radiators. The Vacu-Traps effectually trap the steam and thoroughly drain the radiators of condensation as fast as it accumulates. All the steam condenses and as this operation is continuous, the vacuum is maintained.

Note:—See detailed description of operation on pages 72 and 73

H E A T I N G E Q U I P M E N T

A STEAM HEATING PLANT ALREADY INSTALLED IS MADE FULLY EFFICIENT BY THE RELIABLE EQUIPMENT

The RELIABLE Vacu-Vapor Heating Equipment can readily be applied to two pipe low pressure steam heating plants already installed, and nearly all of the old equipment is utilized.

The following equipment and changes are required:

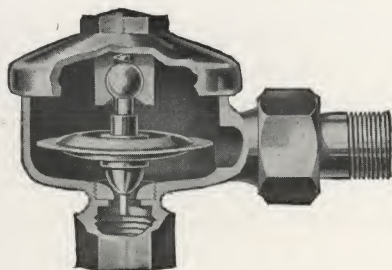
The RELIABLE Equipment consists of Vacu-Traps and Vacu-Graduate Packless Valves (one each for each radiator or coil), a "4 V" Vacu-Vapor Vent Valve for the end of the dry return, a Vacu-Check for the end of each steam main or supply circuit, and a Compound Gauge for the boiler. All the RELIABLE Equipment is thoroughly illustrated and described in this catalog. See diagram on page 76, which shows proper method of installing.

If the supply and return piping is of ample size and properly installed, it does not have to be disturbed. The radiators and coils are invariably utilized.

The boiler is always used unless the capacity is insufficient.

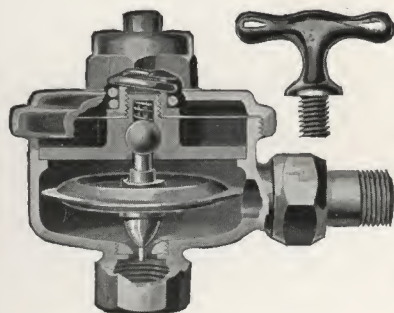
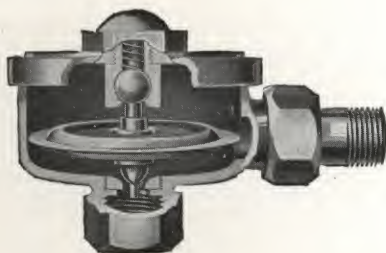
Note:—It is important that all the connections are made perfectly tight. The system should be thoroughly cleaned before being put in operation.

THE VACU-TRAPS



Little Wonder
Vacu-Trap
Made only in
 $\frac{1}{2}$ inch size

No. 1
Vacu-Trap
Made in
 $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$ and $1\frac{1}{2}$
inch sizes



No. 2 Flushing
Vacu-Trap
Made in
 $\frac{1}{2}$, $\frac{3}{4}$ and 1 inch
sizes

Note :— The Vacu-Traps are part of the RELIABLE Vacu-Vapor Heating Equipment. They are thoroughly described in this catalog, pages 46 to 50 inclusive.

THE VACU-GRADUATE PACKLESS RADIATOR VALVE

(With lever-handle)

The Vacu-Graduate Packless Valve with lever-handle is a quick opening, self cleaning, graduating radiator valve of new design, which accurately controls the amount of steam admitted to radiators or coils.

The chart below shows the remarkable simplicity of the Vacu-Graduate Valve, and clearly explains its construction and operation.

COMPOSITION SEAT which makes the Vacu-Graduate Valve packless.

BRONZE VALVE STEM easily removable.

OUTLET of steam to radiator or coil.

PORTS in valve through which steam passes to outlet.

INLET for steam.

A QUARTER TURN of this lever-handle fully opens or closes the valve.

HEAVY PHOSPHOR BRONZE SPRING—always maintains tight seating of valve.

BRONZE VALVE—controls amount of steam admitted by partially or fully opening ports in seat.

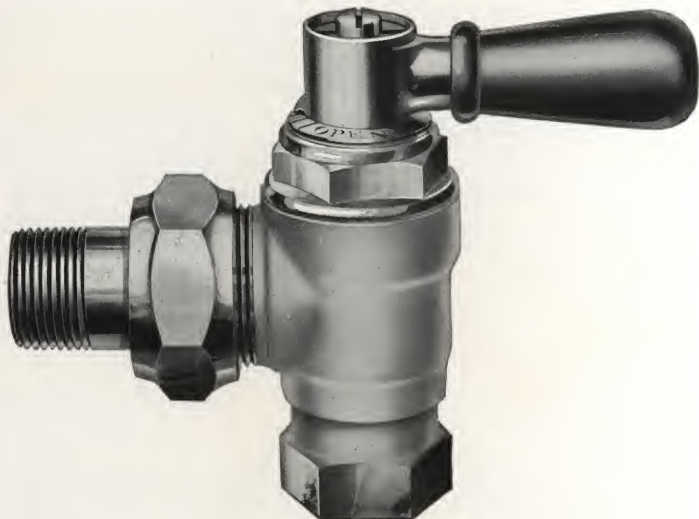
COMPOSITION SEAT on which valve turns. It is selfcleaning, and unaffected by steam.

The Vacu-Graduate Packless Radiator Valve
Patent Applied For

$\frac{3}{4}$ inch size

A Vacu-Graduate Packless Valve with lever-handle is installed on the supply end of each top feed radiator or coil. It provides for varying weather conditions, as in cold weather the radiators and coils can be fully heated and in mild weather only partially heated. The rooms can

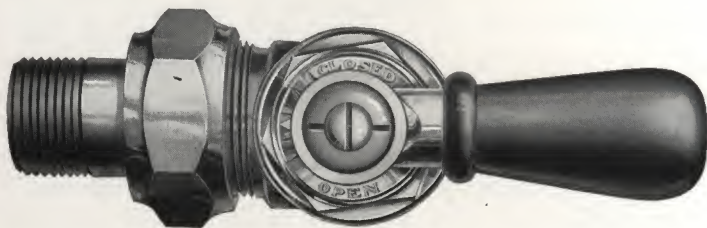
RELIABLE VACU - VAPOR



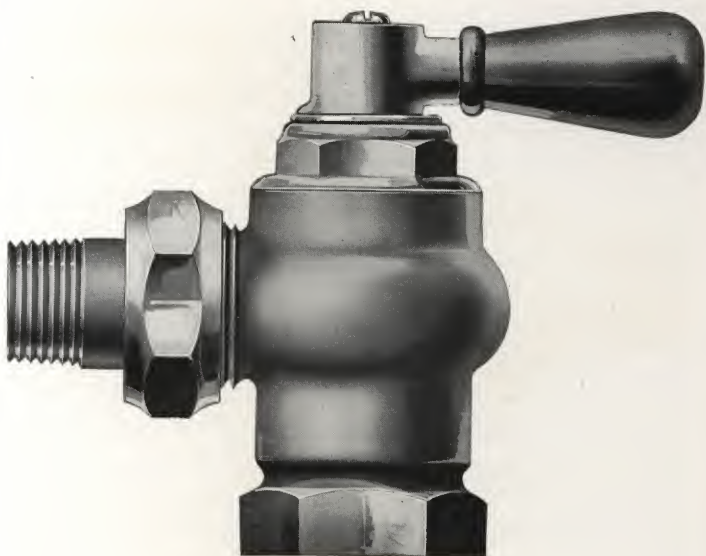
$\frac{3}{4}$ inch size

therefore be heated independently and the desired temperature maintained in each room, regardless of the weather conditions. A graduated dial correctly indicates the amount of vapor and steam admitted.

It will be noticed that only a one-quarter turn of the lever-handle fully opens or closes the Vacu-Graduate Valve. The valve always turns on the seat, so dirt cannot accumulate and wear seat, as is the case with many other radiator supply



Top view $\frac{3}{4}$ inch size



1, 1¼ and 1½ inch sizes

valves. This means the *Vacu-Graduate Valve* is *self-cleaning*.

The Vacu-Graduate Valve is made packless by seat above the valve stem, which is always held tightly in place by an extra large, heavy spring. This spring also maintains a tight seating of the valve, so it cannot leak. There are no complicated ports to set or clog, no packings to wear. The Valve operates easily at all times, and does not stick.

The Vacu-Graduate Packless Valve is undoubtedly the most durable made. The body, valve and valve stem are heavy bronze. The spring is phosphor bronze. The seats are made of a special composition, which is unaffected by steam. The brass graduated dial is plainly marked. The hard wood lever-handle is so shaped that the hand

cannot slip and get burned. It is reinforced by a bronze rod, and will last indefinitely.

Another big advantage of the Vacu-Graduate Valve is the fact that it is *properly and permanently adjusted* at our factory—*no adjustments are necessary when installing, or later.* When it is used in connection with our Vacu-Trap, perfect results are always assured.

The Vacu-Graduate Packless Radiator Valve is made in $\frac{3}{4}$ ", 1", $1\frac{1}{4}$ " and $1\frac{1}{2}$ " sizes, suitable for any size radiator or coil. It is especially attractive in design, and is heavily nickel plated. We can furnish lock shield if desired, without additional charge. See page 80 for dimensions and weights.

Note:—Vacu-Graduate Valves with graduated dial and lever-handle are designed for top feed radiators or coils. For bottom feed we recommend Valves with wheel-handle, described on pages 51 and 52. The latter can also be used for top feed if desired.

THE "4 V"

VACU-VAPOR VENT VALVE

The "4 V" Vacu-Vapor Vent Valve is a new invention which absolutely prevents a steam heating system becoming air bound. It always liberates air freely, but automatically prevents it getting back into the system.

With steam plants having up to 5000 square feet of direct radiation, one "4 V" Valve is installed on end of the dry return, and connected as per diagram on page 76. It will be noticed that the steam main is also vented through the "4 V" Valve.

A large easy operating valve at the top is automatically opened by the air, allowing it to pass out of the system. When the air is exhausted

H E A T I N G E Q U I P M E N T

this valve closes and seats itself automatically, preventing air returning. The "4 V" Valve has a large free opening clear through, so air always passes out quickly. This quick venting feature enables vapor and steam to circulate rapidly, throughout the entire system.

Another big advantage of the "4 V" Valve is the fact that it eliminates the excess pressure trouble, which has long been the weak point in vapor heating systems. Should excess pressure be accidentally created in the boiler condensation will rise up in the returns and enter the "4V" Valve. A float ball rises with the condensation and closes a valve, which shuts off the air passage—in other words seals the system. As soon as the pressure in the returns is equal to the boiler pressure, the condensation passes into boiler. The float ball lowers with the condensation, which permits the air valve to again seat itself and thereby prevent air getting back into the system. There being no air resistance in the returns, the condensation always flows back to the boiler freely.

The "4 V" Vacu-Vapor Vent Valve is substantially made, and will give many years of satisfactory service. The body is heavy iron, galvanized inside and out, so it cannot rust. It is cast in two pieces, securely fastened together with brass cap screws, having a washer between. The valve and valve seat are solid bronze. They are easily accessible, and are renewable. The valve is equipped with a composition seat, which always insures tight seating. The composition float ball is not affected by the hot condensation.

The venting capacity of the "4 V" Valve is 5000 square feet of direct radiation. The inlet connection is 1 inch; the outlet connection $\frac{3}{4}$ inch.

DETAILED DESCRIPTION VACU-VAPOR

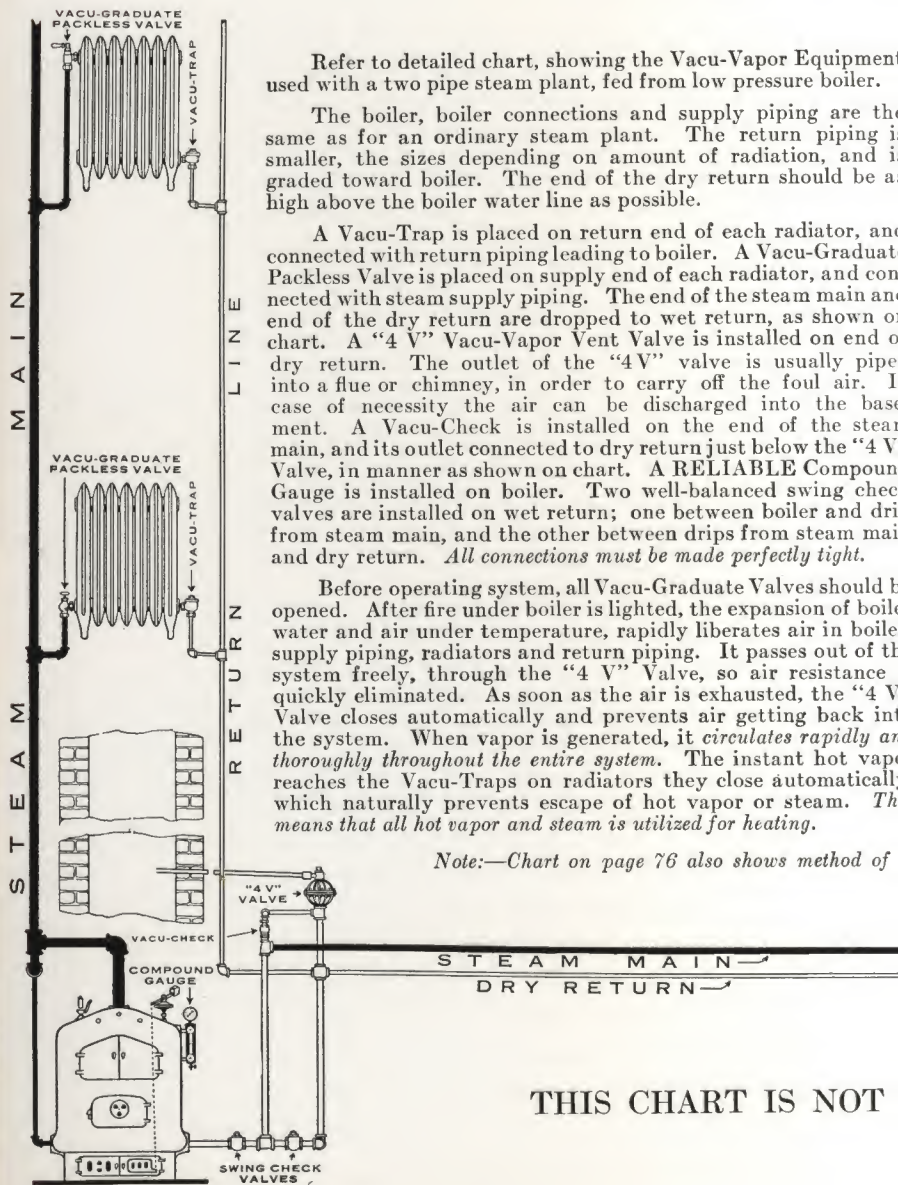
Refer to detailed chart, showing the Vacu-Vapor Equipment used with a two pipe steam plant, fed from low pressure boiler.

The boiler, boiler connections and supply piping are the same as for an ordinary steam plant. The return piping is smaller, the sizes depending on amount of radiation, and is graded toward boiler. The end of the dry return should be as high above the boiler water line as possible.

A Vacu-Trap is placed on return end of each radiator, and connected with return piping leading to boiler. A Vacu-Graduate Packless Valve is placed on supply end of each radiator, and connected with steam supply piping. The end of the steam main and end of the dry return are dropped to wet return, as shown on chart. A "4 V" Vacu-Vapor Vent Valve is installed on end of dry return. The outlet of the "4 V" valve is usually piped into a flue or chimney, in order to carry off the foul air. In case of necessity the air can be discharged into the basement. A Vacu-Check is installed on the end of the steam main, and its outlet connected to dry return just below the "4 V" Valve, in manner as shown on chart. A RELIABLE Compound Gauge is installed on boiler. Two well-balanced swing check valves are installed on wet return; one between boiler and drips from steam main, and the other between drips from steam main and dry return. *All connections must be made perfectly tight.*

Before operating system, all Vacu-Graduate Valves should be opened. After fire under boiler is lighted, the expansion of boiler water and air under temperature, rapidly liberates air in boiler supply piping, radiators and return piping. It passes out of the system freely, through the "4 V" Valve, so air resistance is quickly eliminated. As soon as the air is exhausted, the "4 V" Valve closes automatically and prevents air getting back into the system. When vapor is generated, it circulates rapidly and thoroughly throughout the entire system. The instant hot vapor reaches the Vacu-Traps on radiators they close automatically, which naturally prevents escape of hot vapor or steam. This means that all hot vapor and steam is utilized for heating.

Note:—Chart on page 76 also shows method of



THIS CHART IS NOT

OF OPERATION OF RELIABLE HEATING EQUIPMENT

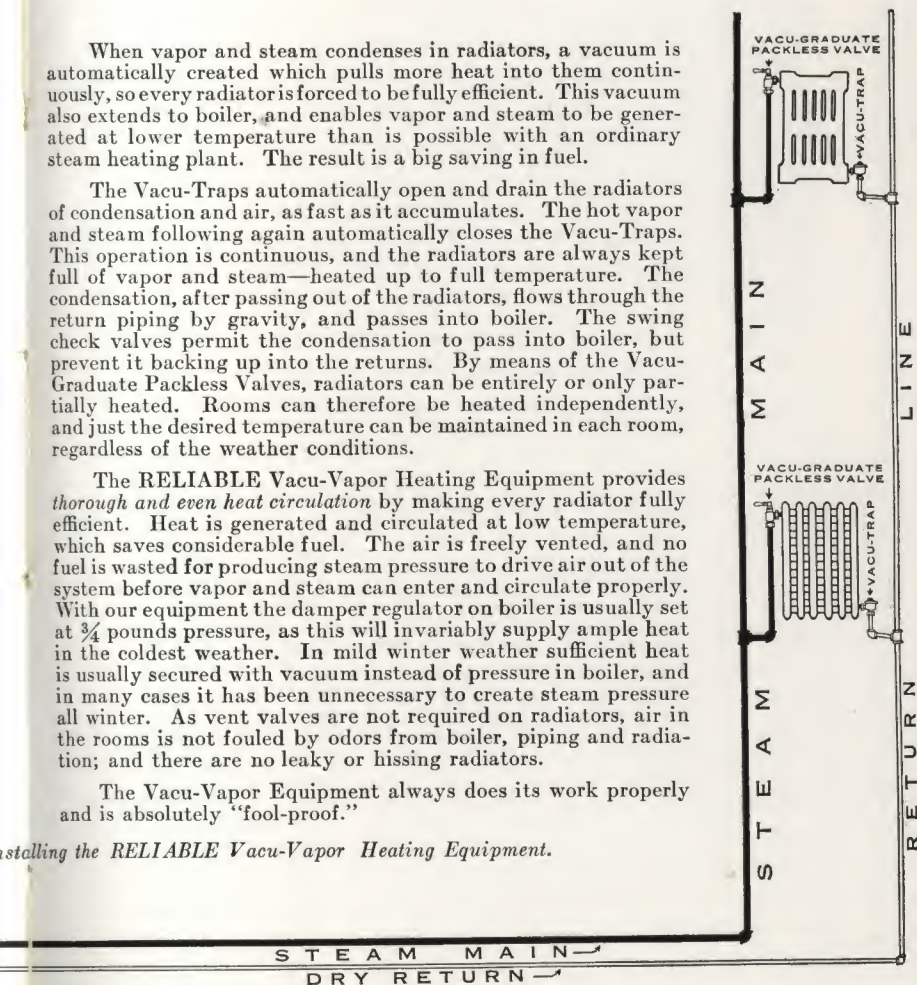
When vapor and steam condenses in radiators, a vacuum is automatically created which pulls more heat into them continuously, so every radiator is forced to be fully efficient. This vacuum also extends to boiler, and enables vapor and steam to be generated at lower temperature than is possible with an ordinary steam heating plant. The result is a big saving in fuel.

The Vacu-Traps automatically open and drain the radiators of condensation and air, as fast as it accumulates. The hot vapor and steam following again automatically closes the Vacu-Traps. This operation is continuous, and the radiators are always kept full of vapor and steam—heated up to full temperature. The condensation, after passing out of the radiators, flows through the return piping by gravity, and passes into boiler. The swing check valves permit the condensation to pass into boiler, but prevent it backing up into the returns. By means of the Vacu-Graduate Packless Valves, radiators can be entirely or only partially heated. Rooms can therefore be heated independently, and just the desired temperature can be maintained in each room, regardless of the weather conditions.

The RELIABLE Vacu-Vapor Heating Equipment provides *thorough and even heat circulation* by making every radiator fully efficient. Heat is generated and circulated at low temperature, which saves considerable fuel. The air is freely vented, and no fuel is wasted for producing steam pressure to drive air out of the system before vapor and steam can enter and circulate properly. With our equipment the damper regulator on boiler is usually set at $\frac{3}{4}$ pounds pressure, as this will invariably supply ample heat in the coldest weather. In mild winter weather sufficient heat is usually secured with vacuum instead of pressure in boiler, and in many cases it has been unnecessary to create steam pressure all winter. As vent valves are not required on radiators, air in the rooms is not fouled by odors from boiler, piping and radiation; and there are no leaky or hissing radiators.

The Vacu-Vapor Equipment always does its work properly and is absolutely "fool-proof."

Installing the RELIABLE Vacu-Vapor Heating Equipment.



NTENDED FOR A WORKING PLAN

THE VACU-CHECK



1/2 inch size

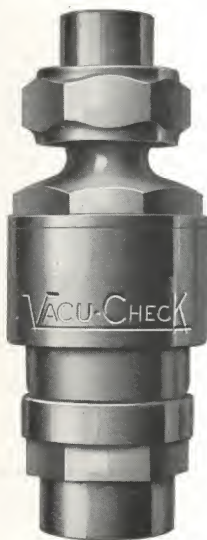
The Vacu-Check is a combined check valve and thermostatic valve which automatically liberates air, and prevents escape of hot vapor or steam.

One Vacu-Check is installed on end of each steam supply main or circuit. It is vented through the "4 V" Vacu-VaporVent Valve. See diagram on page 76. Air passes through the Vacu-Check freely, but as soon as hot vapor reaches it, its thermal member expands, closing the passage instantly. This absolutely prevents escape of hot vapor or steam. A removable strainer at the bottom catches any foreign matter.

The Vacu-Check contains a check valve which prevents air and condensation from the returns getting back into the steam main. This check valve is a simple design, and always seats itself properly.

Like all our other valves the Vacu-Check is durably constructed. The body is heavy brass. The thermal member is rod brass and phosphor bronze. The thermal member seat is a durable composition. The strainer is brass, silver plated, and cannot corrode.

Each Vacu-Check is thoroughly tested, and *properly and permanently adjusted* at our factory—it requires no *adjusting when installing, or afterward*. It is the only valve of its kind. See guarantee on page 2. The Vacu-Check is made in 1/2 and 1 inch sizes, and is heavily nickel plated.



1 inch size

Note:—See specifications and dimensions of the Vacu-Checks on page 80

RELIABLE COMPOUND GAUGE

With our Vacu-Vapor Heating Equipment a **RELIABLE** Compound Gauge is placed on the boiler, to show whether steam pressure or vacuum is in boiler.

The **RELIABLE** Compound Gauge is durably constructed, and will last for many years. It has a non-corrosive movement, mounted direct on the socket. The movement cannot be thrown out of adjustment when Gauge is being installed. The dial is graduated to 15 pounds steam pressure on one side and 30 inches vacuum on the other.



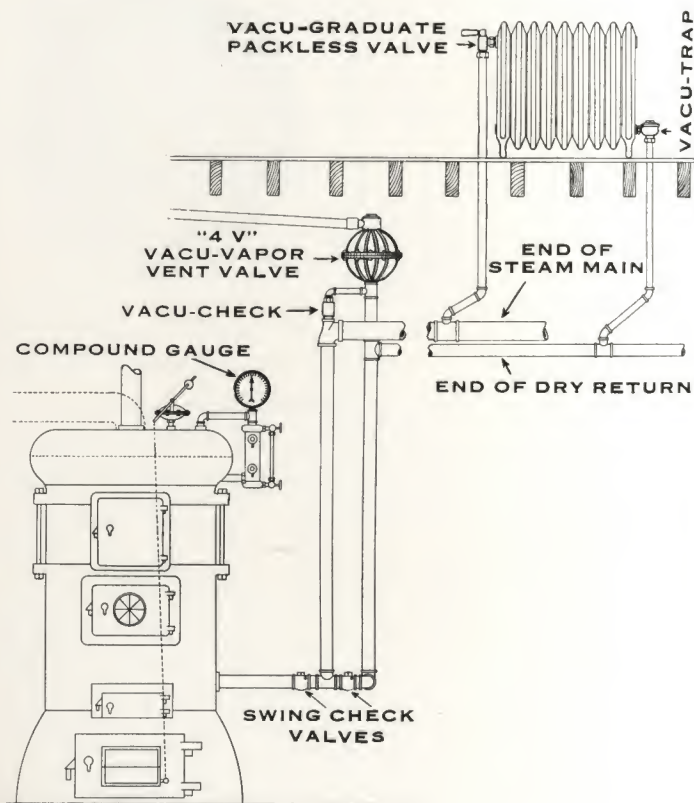
Diameter of dial, $3\frac{1}{2}$ -inches; $\frac{1}{4}$ -inch thread connection; iron case, brass rim

RADIATOR AND COILS

We recommend the use of hot water type radiators, direct or indirect. Steam type radiators can also be used, as well as graded coils.

The same rating is used as in ordinary steam heating, except in climates where the temperature often reaches 10 degrees below zero. It is then necessary to add 10% to the regular steam rating.

RELIABLE VACU - VAPOR



Method of installing RELIABLE Vacu-Vapor Heating Equipment with a two pipe low pressure steam plant having up to 5000 square feet of direct radiation

HEATING EQUIPMENT

SPECIFICATIONS AND DIMENSIONS OF RELIABLE AIR LINE ELECTRIC VACUUM PUMPS

Number of Pump	Max. Cap. Sq. Ft. Direct Radiation	CYLINDER SIZES		SIZE OF CONNECTIONS		Strokes Per Minute
		Bore	Stroke	Discharge	Suction	
1279	4,000	2¼ in.	3 in.	1 in.	1 in.	150
111	5,000	2¼ in.	3 in.	1 in.	1 in.	90
112	10,000	3 in.	3½ in.	1 in.	1 in.	70
113	18,000	4 in.	3½ in.	1¼ in.	1¼ in.	70
114	28,000	4 in.	5 in.	1½ in.	1½ in.	68
115	35,000	5 in.	5 in.	2 in.	2 in.	60

Number of Pump	Horse Power of Motor	DIMENSIONS OVER ALL			Shipping Weight Including Equipment
		Height	Width	Depth	
1279	⅙	29½ in.	17½ in.	32 in.	370 lbs.
111	⅙	16½ in.	14¼ in.	18 in.	270 lbs.
112	⅓	21 in.	24½ in.	34 in.	551 lbs.
113	¾	24¼ in.	24½ in.	34 in.	600 lbs.
114	1	30¾ in.	31½ in.	39 in.	790 lbs.
115	2	30¾ in.	33½ in.	39 in.	998 lbs.

SPECIFICATIONS AND DIMENSIONS OF RELIABLE AIR LINE HYDRAULIC VACUUM PUMPS

Number of Pump	Height Over All	CYLINDER SIZES			SIZE OF CONNECTIONS				Shipping Weight Including Equipment
		Diam. of Motive	Diam. of Suction	Length Stroke	Water Inlet	Waste Water	Air Suction	Air Discharge	
	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Pounds
101	25	2	2½	4	¾	¾	½	½	110 lbs.
102	25	2	2½	4	¾	¾	½	½	140 lbs.
104	29	2½	4	6	¾	¾	½	½	156 lbs.
106	40	3⅝	5⅞	10	¾	¾	¾	¾	200 lbs.

Number of Pump	City Water Pressure Pounds	Max. Cap. Sq. Ft. Direct Radiation	Number of Pump	City Water Pressure Pounds	Max. Cap. Sq. Ft. Direct Radiation
101	20	700	104	40	4,000
101	40	800	106	20	6,600
102	20	900	106	40	9,600
102	40	1,100	2-106	20	14,000
104	20	2,500	2-106	40	20,000

When city water pressure is between 15 and 20 pounds, use pump one size larger than that called for at pressure of 20 pounds

RELIABLE HEATING EQUIPMENT

SPECIFICATIONS AND DIMENSIONS OF RELIABLE RETURN LINE ELECTRIC VACUUM PUMPS

Number of Pump	Max. Cap. Sq. Ft. Direct Radiation	CYLINDER SIZES		SIZE OF CONNECTIONS		Strokes Per Minute
		Bore	Stroke	Discharge	Suction	
2779	2,000	2¼ in.	3 in.	1 in.	1 in.	120
122	5,000	3 in.	3½ in.	2 in.	2 in.	70
123	10,000	4 in.	3½ in.	2 in.	2 in.	70
124	17,000	4 in.	5 in.	3 in.	3 in.	68
125	25,000	5 in.	5 in.	3 in.	3 in.	60

Number of Pump	Horse Power of Motor	DIMENSIONS OVER ALL			Shipping Weight Including Equipment
		Height	Width	Depth	
2779	⅓	29½ in.	17½ in.	32 in.	425 lbs.
122	¾	21 in.	24½ in.	34 in.	693 lbs.
123	1	24¼ in.	27½ in.	34 in.	955 lbs.
124	2	31 in.	33½ in.	40 in.	1110 lbs.
125	2	31 in.	33½ in.	40 in.	1232 lbs.

TABLE OF AIR PIPE SIZES

PIPES	RADIATION (Square Feet)		
	10,000 or less	10,000 to 20,000	20,000 to 35,000
Main Pipes	¾ in.	1 in.	1¼ in.
Risers	¾ inch for one or two stories		
Risers	½ inch for over two stories		
Horizontal Pipes to radiators	¾ inch for any size systems		
Vertical Pipes to VacUstats on radiators	¼ inch for any size systems		

RELIABLE HEATING EQUIPMENT

SPECIFICATIONS AND DIMENSIONS OF THE VACUSTAT

Capacity—150 square feet direct radiation.

Size Connections—Radiator, either $\frac{1}{8}$ or $\frac{1}{4}$ inch.
Pipe, $\frac{1}{4}$ inch.

Dimensions (over all)—Height $3\frac{1}{2}$ inches, Length $2\frac{3}{8}$ inches, Diameter of body $1\frac{1}{4}$ inches.

Net Weight, with flushing fitting 13 ounces.

Net weight of 12 VacUstats, 12 flushing fittings
and one wrench, boxed, 10 pounds 1 ounce.

SPECIFICATIONS AND DIMENSIONS OF THE VACU-TRAPS

TRAPS	Size Inlet and Outlet Connections	Height Over All	Length Over All	Diameter	Net Weight
	Inches	Inches	Inches	Inches	Pounds
Little Wonder Vacu-Trap	$\frac{1}{2}$	$3\frac{1}{4}$	$4\frac{7}{8}$	$2\frac{7}{8}$	$1\frac{7}{8}$
No. 1 Vacu-Trap.....	$\frac{1}{2}$	$3\frac{1}{8}$	$5\frac{3}{8}$	$3\frac{1}{2}$	$2\frac{1}{8}$
No. 1 Vacu-Trap.....	$\frac{3}{4}$	$4\frac{1}{8}$	$6\frac{5}{8}$	$4\frac{1}{4}$	4
No. 1 Vacu-Trap.....	1	$4\frac{1}{8}$	$7\frac{1}{4}$	$4\frac{1}{4}$	4
No. 1 Vacu-Trap.....	$1\frac{1}{4}$	$6\frac{1}{8}$	$9\frac{1}{2}$	7	16
No. 1 Vacu-Trap.....	$1\frac{1}{2}$	$6\frac{1}{8}$	$9\frac{1}{2}$	7	16
No. 2 Flushing Vacu-Trap	$\frac{1}{2}$	$4\frac{5}{8}$	$5\frac{3}{8}$	$3\frac{3}{4}$	$3\frac{3}{8}$
No. 2 Flushing Vacu-Trap	$\frac{3}{4}$	$4\frac{1}{8}$	$6\frac{5}{8}$	$4\frac{1}{2}$	$4\frac{3}{4}$
No. 2 Flushing Vacu-Trap	1	$4\frac{3}{4}$	$7\frac{1}{4}$	$4\frac{1}{2}$	5

RELIABLE HEATING EQUIPMENT

SPECIFICATIONS AND DIMENSIONS OF THE VACU-GRADUATE PACKLESS RADIATOR VALVES

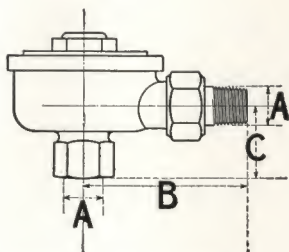
VALVES	Size Inlet and Outlet Connections	Height Over All	Length Over All	Diameter of Body	Net Weight
	Inches	Inches	Inches	Inches	Pounds
$\frac{3}{4}$ inch with lever-handle	$\frac{3}{4}$	$4\frac{1}{2}$	$5\frac{5}{8}$	$1\frac{5}{8}$	2
$\frac{3}{4}$ inch with wheel-handle	$\frac{3}{4}$	5	$4\frac{1}{4}$	$1\frac{5}{8}$	2
1 inch with lever-handle	1	$4\frac{3}{4}$	$6\frac{1}{8}$	$2\frac{3}{8}$	3
1 inch with wheel-handle	1	$5\frac{1}{4}$	$4\frac{3}{4}$	$2\frac{3}{8}$	3
$1\frac{1}{4}$ inch with lever-handle	$1\frac{1}{4}$	$6\frac{1}{4}$	$7\frac{3}{4}$	3	$6\frac{1}{2}$
$1\frac{1}{4}$ inch with wheel-handle	$1\frac{1}{4}$	$6\frac{3}{4}$	6	3	7
$1\frac{1}{2}$ inch with lever-handle	$1\frac{1}{2}$	$6\frac{1}{4}$	8	3	$7\frac{1}{2}$
$1\frac{1}{2}$ inch with wheel-handle	$1\frac{1}{2}$	$6\frac{3}{4}$	$6\frac{1}{4}$	3	8

SPECIFICATIONS AND DIMENSIONS OF THE VACU-CHECKS

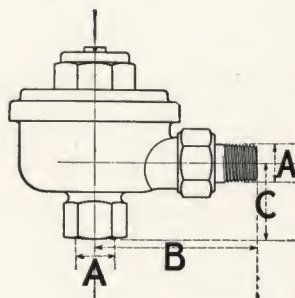
	CONNECTIONS		Height Over All	Diameter	Net Weight
	Inlet	Outlet			
	Inches	Inches	Inches	Inches	
$\frac{1}{2}$ inch Vacu-Check . . .	$\frac{1}{2}$	$\frac{1}{4}$	$4\frac{1}{2}$	$1\frac{1}{2}$	13 oz.
1 inch Vacu-Check . . .	1	$\frac{1}{2}$	$5\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{4}$ lbs.

RELIABLE HEATING EQUIPMENT

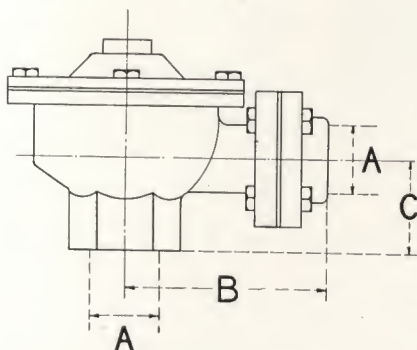
ROUGHING IN DIMENSIONS FOR THE VACU-TRAPS



Little Wonder and $\frac{1}{2}$, $\frac{3}{4}$
and 1 inch No. 1



No. 2 Flushing



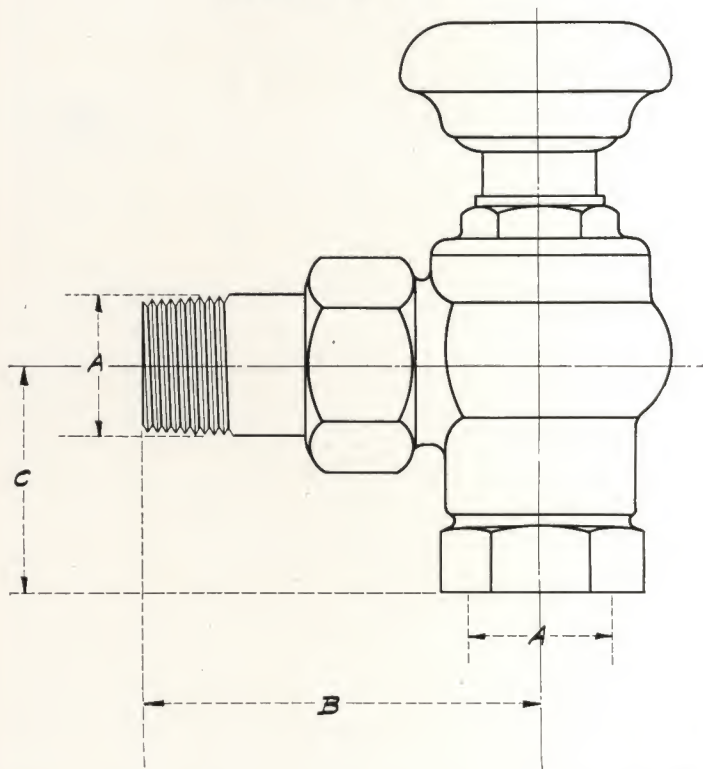
$1\frac{1}{4}$ and $1\frac{1}{2}$ inch No. 1

TRAPS	A	B	C
	Inches	Inches	Inches
Little Wonder.....	$\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{1}{2}$
No. 1 Vacu-Trap.....	$\frac{1}{2}$	$3\frac{3}{8}$	$1\frac{1}{2}$
No. 1 Vacu-Trap.....	$\frac{3}{4}$	$4\frac{1}{8}$	2
No. 1 Vacu-Trap.....	1	5	2
No. 1 Vacu-Trap.....	$1\frac{1}{4}$	6	$2\frac{3}{4}$
No. 1 Vacu-Trap.....	$1\frac{1}{2}$	6	$2\frac{3}{4}$
No. 2 Flushing Vacu-Trap.....	$\frac{1}{2}$	$3\frac{1}{2}$	$1\frac{5}{8}$
No. 2 Flushing Vacu-Trap.....	$\frac{3}{4}$	$4\frac{1}{4}$	$1\frac{13}{16}$
No. 2 Flushing Vacu-Trap.....	1	$4\frac{3}{4}$	$1\frac{13}{16}$

We do not show roughing in dimensions for straightway and right and left corner Vacu-Traps as they are made up "Special," but will gladly furnish such dimensions upon request.

RELIABLE HEATING EQUIPMENT

ROUGHING IN DIMENSIONS FOR THE VACU-GRADUATE PACKLESS RADIATOR VALVES



SIZE OF VALVE	A	B	C
Inches	Inches	Inches	Inches
$\frac{3}{4}$	$\frac{3}{4}$	$2\frac{3}{4}$	$1\frac{1}{8}$
1	1	$3\frac{1}{8}$	$2\frac{1}{8}$
$1\frac{1}{4}$	$1\frac{1}{4}$	$4\frac{1}{2}$	$2\frac{3}{4}$
$1\frac{1}{2}$	$1\frac{1}{2}$	$4\frac{5}{8}$	$2\frac{7}{8}$

*Note :—These dimensions cover lever-handle, wheel-handle
and lock-shield valves*

RELIABLE HEATING EQUIPMENT

COMPLETE SUGGESTIONS FOR SPECIFICATIONS

for the

RELIABLE AIR LINE VACUUM HEATING EQUIPMENT

As every steam heating installation is more or less different, we do not issue standard specifications. However, we give in the following paragraphs, complete suggestions which you will find of value when specifying the RELIABLE Air Line Vacuum Heating Equipment.

BOILER

The boiler shall be a No. steam boiler made by Company, having a rated capacity of square feet of direct radiation. The boiler shall have a capacity of not less than 50% over the direct radiation installed in rooms heated to 70° Fahrenheit.

The steam outlet connections from the boiler to the steam headers or mains must be of such number and size that the velocity of the steam passing through them will be equal.

The Bishop-Babcock-Becker Company's Compound Gauge shall be installed on the boiler.

The boiler foundation shall be brick or concrete, of such thickness and so constructed that it will not settle. If basement or boiler room has concrete floor of ample thickness, the boiler may be set on it. All joints, connections, valves, trimmings, stuffing boxes, etc., are to be made air and gas tight.

WATER LINE

The water line of the boiler must be at least 30 inches below the low points of the steam mains. The exact distance should be based on the amount of radiation, and sizes of piping.

CHIMNEY

The chimney must be of proper size and construction, to insure good draught. All the joints shall be made tight.

RELIABLE HEATING EQUIPMENT

SMOKE PIPE AND DAMPER REGULATOR

The smoke pipe shall be of ample size; approved construction; and made of high grade galvanized iron of proper weight. All joints shall be made air and gas tight.

A suitable automatic damper regulator shall be placed on boiler, and be operated by the steam pressure in the boiler, or by the temperature in a principal room.

PIPING

The Heating Contractor is to install steam, air and return piping of proper size, and connect as required. Full standard weight mild steel or wrought iron pipe shall be used.

The steam mains shall be started as high as the building construction will permit, and be properly graded down towards the extreme ends. The steam mains must be extended at least 3 feet past the last riser or radiator connection before being reduced in size, and be properly dripped to the wet return. These drips must be connected to the return below the boiler water line, so they will be properly sealed and prevent short circuits.

The air mains should be properly graded down toward the vacuum pump. The sizes of all air piping should be in accordance with schedule published by the Bishop-Babcock-Becker Company.

The return piping should be of proper size and graded toward the boiler, so that the water returns properly.

All piping should be carefully reamed out after cutting and all openings plugged until connections are made, so there will be no obstructions. The piping shall be substantially hung.

All connections shall be made tight.

FITTINGS AND JOINTS

Eccentric fittings shall be used on all horizontal steam main reductions.

All piping shall be provided with swing or approved expansion joints, to take care of expansion or contraction.

RELIABLE HEATING EQUIPMENT

SLEEVES AND PLATES

Suitable adjustable combined floor sleeves and floor and ceiling plates of proper size shall be placed on all risers passing through floors or partitions, to permit free movement.

RADIATORS AND COILS

The radiators and coils shall be of ample size, and made on lines of the greatest efficiency. They should be thoroughly cleaned and tested at the factory. The sections must be free from defects, such as pin holes, etc.

All radiator joints shall be made tight.

RADIATOR VALVES

The radiator supply valves should be of standard make. If packless valves are used, they should be carefully selected.

TESTING THE RADIATORS AND PIPING

The radiators and piping shall be tested as the work progresses and made tight under water pressure.

Where the risers or other piping is to be concealed, and where the radiator connections are to be placed under the floor, they must be carefully tested and made tight before they are concealed. This same precaution shall be taken where the piping is to be covered. All piping must be tested before being painted.

AUTOMATIC AIR VALVE

The Bishop-Babcock-Becker Company's VacUstats shall be provided, one for each radiator or coil.

Each VacUstat shall include a flushing fitting, for use when cleaning system.

VACUUM PUMP AND EQUIPMENT

The Bishop-Babcock-Becker Company's No. Reliable Electric or Hydraulic Vacuum Pump and necessary Equipment to comprise a complete automatic working outfit shall be used.

The RELIABLE Vacuum Pump and Equipment to be installed and operated in accordance with installation chart and instruction sheet furnished by the Bishop-Babcock-Becker Company.

RELIABLE HEATING EQUIPMENT

CLEANING AND TESTING THE SYSTEM

The entire heating system shall be properly cleaned and tested in accordance with instruction sheet furnished by The Bishop-Babcock-Becker Company.

COVERING AND PAINTING

The piping and radiators shall be painted, and piping and boiler covered as follows:

GUARANTEE

The RELIABLE Vacuum Heating Equipment is fully guaranteed by The Bishop-Babcock-Becker Company to be correct in mechanical principles and construction. They further guarantee that all parts of their equipment have been properly tested and adjusted, and are free from original defects in material, and of first-class workmanship. They agree to replace or repair, free of charge, any parts of their equipment that should prove defective—ordinary wear and tear, abuse and neglect excepted—upon delivery to their factory for inspection.

Note—These suggestions apply to a one pipe steam heating plant, with low pressure boiler. If the system is to be fed by steam from a central station; exhaust steam; or reduced steam from a high pressure boiler, the above suggestions can be utilized if all paragraphs pertaining to boiler are omitted.

RELIABLE HEATING EQUIPMENT

COMPLETE SUGGESTIONS FOR SPECIFICATIONS

for the

RELIABLE RETURN LINE VACUUM HEATING EQUIPMENT

As every steam heating installation is more or less different, we do not issue standard specifications. However, we give in the following paragraphs, complete suggestions which you will find of value when specifying the RELIABLE Return Line Vacuum Heating Equipment.

BOILER

The boiler shall be a No. ---- steam boiler made by----- Company, having a rated capacity of-----square feet of direct radiation. The boiler shall have a capacity of not less than 50% over the direct radiation installed in rooms heated to 70° Fahrenheit.

The steam outlet connections from the boiler to the steam headers or mains must be of such number and size that the velocity of the steam passing through them will be equal.

The Bishop-Babcock-Becker Company's Compound Gauge shall be installed on the boiler.

The boiler foundation shall be brick or concrete, of such thickness and so constructed that it will not settle. If basement or boiler room has concrete floor of ample thickness, the boiler may be set on it. All joints, connections, valves, trimmings, stuffing boxes, etc., are to be made air and gas tight.

CHIMNEY

The chimney must be of proper size and construction, to insure good draught.

All chimney joints shall be made tight.

SMOKE PIPE AND DAMPER REGULATOR

The smoke pipe shall be of ample size; approved construction; and made of high grade galvanized iron of proper weight. All joints shall be made air and gas tight.

RELIABLE HEATING EQUIPMENT

A suitable automatic damper regulator shall be placed on boiler, and be operated by the steam pressure in the boiler, or by the temperature in a principal room.

PIPING AND FITTINGS

The Heating Contractor is to install steam, return, water and drip piping of proper size, and connect as required. Full standard weight mild steel or wrought iron pipe and cast iron fittings shall be used.

The steam mains shall be started as high as the building construction will permit, and be properly graded down towards the extreme ends. The steam mains should be extended beyond the last riser or radiator connection before being reduced in size, and be properly dripped to the return.

The return mains must be properly graded down towards the vacuum pump.

All piping shall be carefully reamed out, so there will be no rough or extended surfaces which will clog the piping or interfere with proper circulation. All connections shall be made tight.

EXPANSION AND CONTRACTION

Suitable swing connections shall be used where required, to allow for expansion and contraction of mains, risers and connections, without interfering with the grades, or causing leaks or other damage.

HANGERS AND SUPPORTS

The steam mains and laterals shall be hung with wrought iron beam clamps or special bolts, and expansion swing or roller hangers. The hangers to be properly placed, according to the building construction.

SLEEVES AND PLATES

Approved adjustable sleeves with floor and ceiling plates shall be placed on all piping passing through floors or partitions, to permit free movement.

RADIATORS AND COILS

All radiators shall be ----- type. Wall radiators shall be -----, and pipe coils to be made up of ----- inch standard wrought iron or mild steel pipe with return bends or branch tees with suitable spring piece sections as required for expansion and contraction.

RELIABLE HEATING EQUIPMENT

RADIATOR VALVES

The Bishop-Babcock-Becker Company's Vacu-Graduate Packless Valve of proper size shall be furnished for the supply to each radiator or coil. Valves used for top feed shall be equipped with lever-handle, and those used for bottom feed with wheel-handle.

The Bishop-Babcock-Becker Company's No. -----
Vacu-Trap of proper size shall be furnished for the return connection of each radiator or coil; also one No. ----- for each main and riser drip.

TESTING THE RADIATORS AND PIPING

Where the risers or other piping is to be concealed, and where the radiator connections are to be placed under the floor, they shall be carefully tested and made tight before they are concealed. This same precaution shall be taken where the piping is to be covered.

All piping must be tested before being painted.

ELECTRIC VACUUM PUMP AND EQUIPMENT

The Bishop-Babcock-Becker Company's No. RELIABLE Electric Vacuum Pump and necessary Equipment to comprise a complete automatic working outfit shall be used.

The RELIABLE Electric Vacuum Pump and Equipment to be installed and operated in accordance with installation chart and instruction sheet furnished by The Bishop-Babcock-Becker-Company.

AUTOMATIC AIR SEPARATING TANK

The Bishop-Babcock-Becker Company's RELIABLE Air Separating Tank shall be used, if returns are made to low pressure boiler, closed receiving tank or closed feed water heater.

The installation to be done in accordance with installation chart and instruction sheet furnished by The Bishop - Babcock - Becker Company.

WORKMANSHIP

All heating equipment shall be installed in a neat and substantial manner.

RELIABLE HEATING EQUIPMENT

CLEANING AND TESTING THE SYSTEM

The entire heating system shall be properly cleaned and tested in accordance with instruction sheet furnished by The Bishop-Babcock Becker Company.

COVERING AND PAINTING

The piping and radiators shall be painted, and piping and boiler covered as follows:

GUARANTEE

The RELIABLE Vacuum Heating Equipment is fully guaranteed by The Bishop-Babcock-Becker Company to be correct in mechanical principles and construction. They further guarantee that all parts of their equipment have been properly tested and adjusted, and are free from original defects in material and of first-class workmanship. They agree to replace or repair, free of charge, any parts of their equipment that should prove defective—ordinary wear and tear, abuse and neglect excepted—upon delivery to their factory for inspection.

Note—These suggestions apply to a two pipe steam heating plant, with low pressure boiler. If the system is to be fed by steam from a central station, exhaust steam, or reduced steam from a high pressure boiler, the above suggestions can be utilized if all paragraphs pertaining to boiler are omitted.

RELIABLE HEATING EQUIPMENT

COMPLETE SUGGESTIONS FOR SPECIFICATIONS

for the

RELIABLE VACU-VAPOR HEATING EQUIPMENT

As every steam heating installation is more or less different, we do not issue standard specifications. However, we give in the following paragraphs, complete suggestions which you will find of value when specifying the RELIABLE Vacu-Vapor Heating Equipment.

BOILER

The boiler shall be a No. steam boiler made by Company, having a rated capacity of square feet of direct radiation. The boiler shall have a capacity of not less than 50% over the direct radiation installed in rooms heated to 70° Fahrenheit.

The steam outlet connections from the boiler to the steam headers or mains must be of such number and size that the velocity of the steam passing through them will be equal.

The Bishop-Babcock-Becker Company's Compound Gauge shall be installed on the boiler.

The boiler foundation shall be brick or concrete, of such thickness and so constructed that it will not settle. If basement or boiler room has concrete floor of ample thickness, the boiler may be set on it. All joints, connections, valves, trimmings, stuffing boxes, etc., are to be made air and gas tight.

CHIMNEY

The chimney must be of proper size and construction, to insure good draught. All chimney joints shall be made tight.

SMOKE PIPE AND DAMPER REGULATOR

The smoke pipe shall be of ample size; approved construction; and made of high grade galvanized iron of proper weight. All joints shall be made air and gas tight.

A suitable automatic damper regulator shall be placed on boiler.

RELIABLE HEATING EQUIPMENT

PIPING AND FITTINGS

The Heating Contractor is to install steam, return, water and drip piping of proper size, and connect as required. Full standard weight mild steel or wrought iron pipe and cast iron fittings shall be used.

The steam mains shall be started as high as the building construction will permit and be properly graded down towards the extreme ends. The steam mains should be extended beyond the last riser or radiator connection before being reduced in size, and be properly dripped to the return.

The return mains must be properly graded down towards the boiler. The end of the dry return shall be as high above boiler water line as possible.

All piping shall be carefully reamed out, so there will be no rough or extended surfaces to clog the piping or interfere with proper circulation.

All connections shall be made tight.

EXPANSION AND CONTRACTION

Suitable swing connections shall be used where required, to allow for expansion and contraction of mains, risers and connections, without interfering with the grades, or causing leaks or other damage.

HANGERS AND SUPPORTS

The steam mains and laterals shall be hung with wrought iron beam clamps or special bolts, and expansion swing or roller hangers. The hangers to be properly placed, according to the building construction.

SLEEVES AND PLATES

Approved adjustable sleeves with floor and ceiling plates shall be placed on all piping passing through floors or partitions, to permit free movement.

RADIATORS AND COILS

All radiators shall be ----- type. Wall radiators shall be -----, and pipe coils to be made up of ----- inch standard wrought iron or mild steel pipe with return bends or branch tees with suitable spring piece sections as required for expansion and contraction.

RELIABLE HEATING EQUIPMENT

RADIATOR VALVES

The Bishop-Babcock-Becker Company's Vacu-Graduate Packless Valve of proper size shall be furnished for the supply to each radiator or coil. Valves used for top feed shall be equipped with lever-handle and those used for bottom feed with wheel-handle

The Bishop-Babcock-Becker Company's No. ----- Vacu-Trap of proper size shall be furnished for the return connection of each radiator or coil.

TESTING THE RADIATORS AND PIPING

Where the risers or other piping is to be concealed, and where the radiator connections are to be placed under the floor, they shall be carefully tested and made tight before they are concealed. This same precaution shall be taken where the piping is to be covered.

All piping must be tested before being painted.

AUTOMATIC VENT VALVES

The Bishop-Babcock-Becker Company's "4 V" Vacu-Vapor Vent Valve shall be furnished for ends of the dry returns. The installation to be done in accordance with chart furnished by the Bishop-Babcock-Becker Company.

The Bishop-Babcock-Becker Company's ---- inch Vacu-Check shall be furnished for ends of the steam mains, and supply circuits where necessary. The installation to be done in accordance with chart furnished by The Bishop-Babcock-Becker Company.

CHECK VALVES

Two well-balanced swing check valves shall be furnished for the wet return. These to be installed in accordance with chart furnished by The Bishop-Babcock-Becker Company.

WORKMANSHIP

All heating equipment shall be installed in a neat and substantial manner.

CLEANING AND TESTING THE SYSTEM

The entire heating equipment shall be thoroughly cleaned and tested before it is operated.

RELIABLE HEATING EQUIPMENT

COVERING AND PAINTING

The piping and radiators shall be painted, and piping and boiler covered as follows:

GUARANTEE

The RELIABLE Vacuum Heating Equipment is fully guaranteed by The Bishop-Babcock-Becker Company to be correct in mechanical principles and construction. They further guarantee that all parts of their equipment have been properly tested and adjusted, and are free from original defects in material and of first-class workmanship. They agree to replace or repair, free of charge, any parts of their equipment that should prove defective—ordinary wear and tear, abuse and neglect excepted—upon delivery to their factory for inspection.

Note:—These suggestions apply to a two pipe steam heating plant with low pressure boiler. If the system is to be fed by steam from a central station, exhaust steam, or reduced steam from a high pressure boiler, the above suggestions can be utilized if all paragraphs pertaining to boiler are omitted.

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RELIABLE

VACUUM &
VACU-VAPOR
HEATING
EQUIPMENT



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